

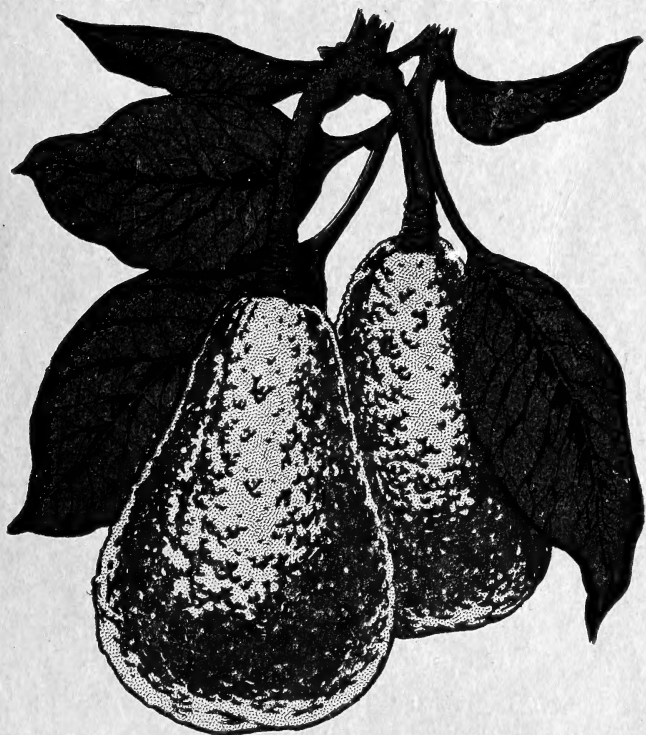


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21
Annual Report
1918 and 1919

California
AVOCADO
Association



Los Angeles, California

Price One Dollar

Yearbook

(ANNUAL REPORT)

OF THE

CALIFORNIA AVOCADO *society* (ASSOCIATION)

FOR THE YEARS

1918 and 1919

Including Reports of the Third Annual Meeting
Held in Los Angeles, May 18 and 19, 1918,
and the Fourth Annual Meeting held in
Pasadena, May 9 and 10, 1919.

ISSUED JULY, 1919

LOS ANGELES, CALIFORNIA

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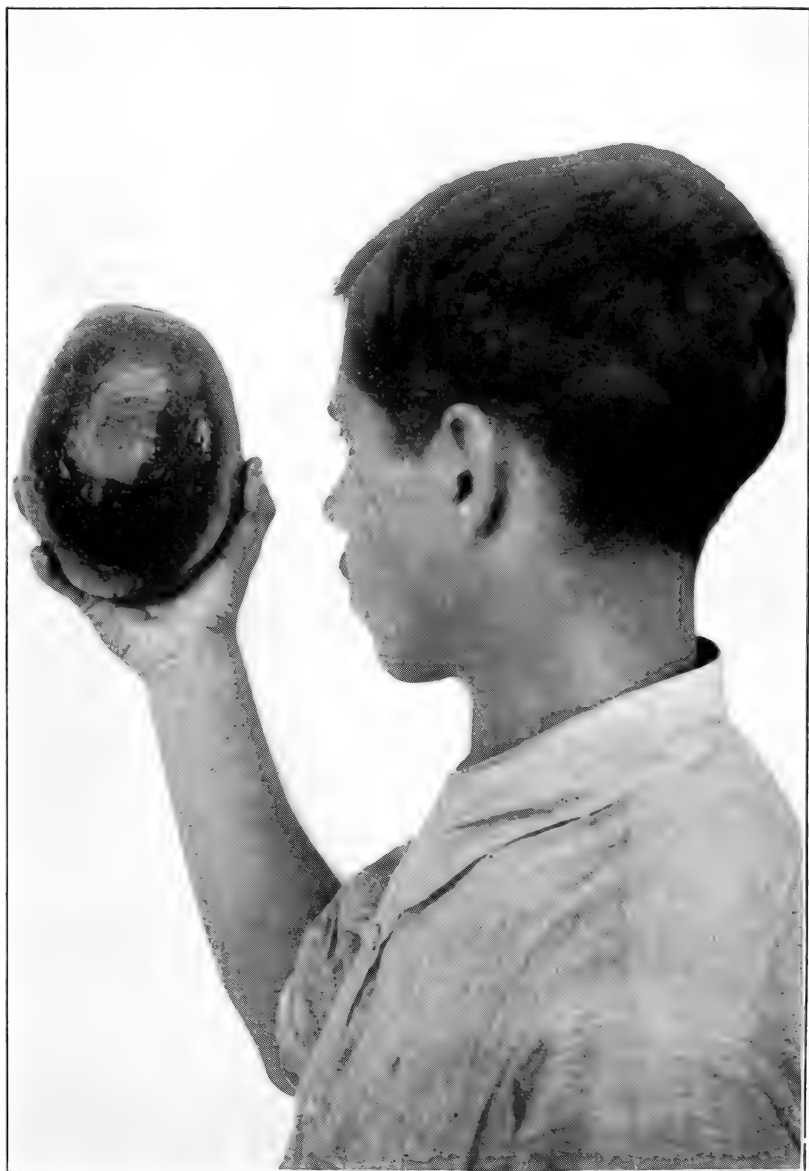


Plate I.

Photo by Wilson Popenoe

A Good Specimen of the West Indian Race

Grown at Tapachula, Chiapas. Fruit weighs nearly two pounds.

CALIFORNIA AVOCADO ASSOCIATION

OFFICERS

- WM. H. SALLMON.....*President*
401 So. Title Building, San Diego
- J. M. ELLIOTT.....*Vice-President*
First National Bank, Los Angeles
- W. L. HARDIN.....*Secretary and Treasurer*
Mt. Washington, Los Angeles

DIRECTORS

Term Expires 1920

- CHAS. D. ADAMS, Upland
T. U. BARBER, Puente
H. J. WEBBER, Riverside

Term Expires 1921

- J. M. ELLIOTT, Los Angeles
LESTER KELLER, Yorba Linda
WM. H. SALLMON, San Diego

Term Expires 1922

- W. L. HARDIN, Los Angeles
MRS. J. T. STEWART, Los Angeles
A. F. YAGGY, Santa Barbara

NOTICE—The Association does not hold itself responsible for the opinions and statements expressed by the authors of the various papers published in its reports.

The illustrations used in the report must not be taken as illustrating the most desirable varieties. They are used merely as a means of illustrating the range of variation.

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FOREWORD

The Reports of the California Avocado Association for 1918 and 1919 have been published in one volume, owing to the fact that the prevalence of influenza throughout the country during the latter part of 1918 and the early part of 1919 made it practically impossible to hold any meeting of the Association during the fall or winter. The present volume, therefore, contains the reports of two annual meetings.

Notwithstanding the World War and the epidemic of influenza, the membership has increased rapidly during the last year. More than 100 new members have been taken into the Association since May 1st, 1918. It is to be hoped that this growth may continue, and even increase, for many years to come, as the future work and efficiency of the Association depend largely upon the increase in membership.

Up to the present time the work of the Association has naturally been devoted, in a large measure, to the study of varieties and scientific investigations of the avocado as a food. It is our intention, not only to continue extensive work in these directions, but to take up also the problems of marketing fruit, the susceptibility of the avocado to hot and cold weather, the standardization of pack for shipment, the regulation, as far as possible, of the prices for different varieties, the keeping of individual tree records, the education of the public to a more general use of avocados, and any other problems which may arise as the industry grows.

W. L. HARDIN, Secretary.

MEMBERS

A resolution passed by the Board of Directors, June 3rd, 1919, provides that the names of members who are delinquent two years in the payment of their dues shall be taken from the list.

Adams, Chas. D.....	Upland, Cal.	
Adams, John S.....	R. F. D. 2, Pomona,	"
Adams, R. C.....	R. F. D. 1, Box 400, Houston,	Tex.
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Allcock, H. E.....	Hotel Maryland, Pasadena,	"
Allen, R. C.....	Bonita,	"
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Andrews, W. L.....	1552 Pioneer Dr., Glendale,	"
Armstrong Nurseries	Ontario,	"
Baker, V. W.....	Claremont,	"
Ballard, M. J.....	7th and M Sts., Sacramento,	"
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Barnes, W. H.....	Ventura,	"
Barrett, Carter.....	Care of Hart & Barber Avocado Co.,	Puente,
Barron, A. Ellis.....	P. O. Box 992, San Diego,	"
Bartlett, Rev. Dana W.....	1437 Malvern Ave., Los Angeles,	"
Beach, John B.....	West Palm Beach,	Fla.
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Bell, David C.....	Saratoga,	"
Bell, E. F.....	R. F. D. 2, Anaheim,	"
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Booth, Chas. F.....	R. F. D. 1, Long Beach,	"
Bradford, A. S.....	Placentia,	"
Browning, V. A.....	R. F. D. 2, Box 34, Anaheim,	"
Bryant, O. T.....		
	Care John Overton, 1019 N. Mariposa Ave., Los Angeles,	"
Bryant and Greenwood.....	1301-1306 Westminster Bldg., Chicago,	Ill.
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Carrier, W. D.....	Winter Haven,	Fla.

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 Coolidge, D. W. Colorado and Hill Sts., Pasadena, "
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 Curtis, Richard S. R. F. D. 1, Box 92A, Covina, "

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 Fesler, Martin Covina, "
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 Fleming, W. J. 6718 South Shore Drive, Chicago, Ill.
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 Flynn, W. Earl Monrovia, "
 Frost, Wm. 1757 N. Serrano Ave., Los Angeles, "
 Fulton, S. M. Val Vista and Cleveland Sts., Pomona, "

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 Gage, Earl D. R. F. D. 2, Box 12, Fullerton, "
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 Goodwin, R. L. Fort Pierce, "

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 Hardin, W. L. Mount Washington, Los Angeles, "
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 Hartman, Miss Katherine. Grossmont, "
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 Hass, Philip. 1743 Orchid Ave., Los Angeles, "
 Hay, Henry. R. F. D. 1, Box 93, Santa Ana, "
 Hayden, T. N. North San Diego, "
 Healy, G. B. 1322 Laurel Ave., Los Angeles, "
 Heller, Dr. Chas. C. 741 W. 11th St., Los Angeles, "
 Hertrich, Wm. San Gabriel, "
 Hettinger, J. G. San Fernando, "
 Hills, R. W. 175 Fremont St., San Francisco, "
 Hills, R. W. Jr. 175 Fremont St., San Francisco, "
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 Hislop, Wm. S. R. F. D. 13, Box 121H, Los Angeles, "
 Hoff, J. E. 1850 Vista St., Los Angeles, "
 Hoffman, Geo. D. P. O. Box 438, Pasadena, "
 Holloway, W. H. Box 49, Yorba Linda, "
 Howard, H. E. San Dimas, "
 Hubbard, C. D. Carpinteria, "
 Hughes, H. H. 1038 4th St., Santa Monica, "

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 Johnson, Geo. H. 3973 Budlong Ave., Los Angeles, "

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 Knight, E. E. Yorba Linda, "
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 Langworthy, R. F. 621 S. Breed St., Los Angeles, "
 Lawless, W. J. 506 West Grand View, Sierra Madre, "
 Leeke, W. T. Upland, "
 Lesperance, Leo B. 521 Central Bldg., Los Angeles, "
 Limona Heights Co. Riverside, "
 Lobingier, Dr. Andrew S. 710 Merritt Bldg., Los Angeles, "

Mann, O. A. Yorba Linda, "
 Manning, Dr. Will R. Fillmore, "
 Manz, A. F. Philadelphia and Pierce Sts., Whittier, "
 Martin Bros. Claremont, "
 Marvin, Burdette K. P. O. Box 525, Riverside, "
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 McClure, John. 3425 N. Broadway, Los Angeles, "
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 McNaghten, Malcolm. 819 Investment Bldg., Los Angeles, "
 McPherson, Wm. R. F. D. 3, Orange, "
 Merritt, Geo. 1202 Garden St., San Luis Obispo, "
 Miles, Harry S. 314 S. First St., Alhambra, "
 Mitchell, E. Pryce. 320 State St., Santa Barbara, "
 Moomaw, W. F. Box 372, Alhambra, "
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 Moore, Stephen P. Cerritos St., Azusa, "
 Moss, Leon F. 1241 S. Lake St., Los Angeles, "
 Murry, Wm. D. 1285 Laurel Ave., Los Angeles, "

Needham, C. E. Glendora, "
 Newkaemper, Wm. 788 Curtis St., Pasadena, "
 Nichols, C. O. Bostonia, "
 Niles, L. D. Lucerne Park, Fla.
 Norton, Mayhew. Box 3, Montalvo, Cal.
 Noyes, F. B. Vacaville, "

Oliver, L. D. Yorba Linda, "
 Ostrand, Edward. . . Van Buren Hotel, 156 Van Buren St., Chicago, Ill.

Pacific Guano and Fertilizer Co. . . 718 Central Bldg., Los Angeles, Cal.
 Paine, C. W. San Fernando, "
 Patton, Madge. 718 Investment Bldg., Los Angeles, "
 Perl, L. A. 120 Hellman Ave., Los Angeles, "
 Petersen, Edwin D. Altadena, "
 Phillips, Titus. 828 S. 4th St., Alhambra, "
 Pickerill, W. O. 1309 Doutz St., Hanford, "
 Pitcairn, Robt Jr. 289 State St., Pasadena, "
 Point Loma Homestead. Point Loma, "
 Popenoe, F. O. West India Gardens, Altadena, "
 Popplewell, Wm. M. R. F. D. 1, Orange, "
 Prentice, James Q. 2150 Garfield Ave., Pasadena, "
 Price, R. O. Upland, "

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 Rideout, A. R. Whittier, Cal.
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 Robinson, H. E. P. O. Bldg., West Palm Beach, Fla.
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 Roundtree, H. H. Woodlake, "
 Rubell, W. T. Redondo Beach, "
 Rugg, W. F. Upland, "
 Russell, Grover T. 729 Van Nuys Bldg., Los Angeles, "

Sallmon, Wm. H. 401 So. Title Bldg., San Diego, "
 Savage, Frank. U. S. Dept. of Agriculture, Eustis, Fla.
 Schaeffers, Joseph. Doctor's Inlet, "

Selover, Chas. R.	Yorba Linda, Cal.
Sexton, Mariette	Goleta, "
Shaffer, Geo. B.	First National Bank, Los Angeles, "
Sharpless, B. H.	Santa Ana, "
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Sherlock, W. P.	2202 E. Colorado St., Pasadena, "
Sherwood, Walter J.	Care Art Institute, Chicago, Ill.
Simcoe, B. F.	La Mesa, Cal.
Sinsabaugh, Mrs. Geo.	3118 S. Figueroa St., Los Angeles, "
Skinner, R. W.	Yuba City, "
Smith, Dr. H. L.	Monrovia, "
Smith, Maltby	R. F. D. 1, Box 395, San Gabriel, "
Speyers, A. W.	Yakima, Wash.
Spinks, Wm. A.	Duarte, Cal.
Staley, Arthur	Fullerton, "
Stearns, Henry A.	810 Los Robles Ave., Pasadena, "
Stephens, Wm. D.	Montebello, "
Stevens, Sherman	Tustin, "
Stevenson, Arthur	969 Topeka St., Pasadena, "
Stewart, Mrs. J. T.	1110 W. Washington St., Los Angeles, "
Stimson, W. H.	R. F. D. 1, Box 123, Los Angeles, "
Stonebrook, Dr. H. B.	Kinney-Kendall Blk., Pasadena, "
Stratton, B. C.	La Verne, "
Sunshine Co.	407 Consolidated Realty Bldg., Los Angeles, "
Swarthout, W. W.	25 S. Delacy St., Pasadena, "
Taft, C. P.	Orange, "
Thacher, E. S.	Topa Topa Ranch, Nordhoff, "
Truitt, Geo. B.	Oceano, "
Underhill, E. F.	Genesee Ranch, Glendora, Cal.
Upton, Harry A.	1131 N. Vermont Ave., Los Angeles, "
Utt, C. E.	Tustin, "
Vernon, M.	Yorba Linda, Cal.
Wagner, Chas. F.	1295 Fairfax Ave., Los Angeles, "
Walker, Jos. H.	1547 Las Palmas Ave., Los Angeles, "
Walker, T. J.	San Fernando, "
Ward Nursery, Irving N.	192 N. Mountain Trail, Sierra Madre, "
Waterbury, G. W.	Corona, "
Waters, Genetta H.	Lemon Grove, "
Waters, Mrs. Maude C.	900 W. Adams St., Los Angeles, "
Whedon, J. T.	Yorba Linda, "
White, Cornelia B.	Palm Springs, "
White, Ralph A.	Box 263, Glendora, "
Wiatt, R. E.	Alhambra, "
Wilder, G. W.	Butterick Bldg., New York, N. Y.
Wilhelm, A. A.	R. F. D. 1, Box 583, San Gabriel, Cal.
Williams, A. B.	Care Citizens' Trust and Savings Bank, Los Angeles, "

Wimberly, L. W.....	Ontario, Cal.
Windelstadt, Dr. E. F.....	210 E. Mariposa Ave., Eagle Rock, “
Woodruff, Geo. H.....	Lamanda Park, “
Woods, Robt. S.....	919 S. Bonnie Brae St., Los Angeles, “
Worsham Ranch Co.....	Whittier, “
Yaggy, Arthur F.....	2138 Emerson Ave., Santa Barbara, “
Zapf, Alfred E.....	496 W. Walnut Ave., Orange, “

HONORARY MEMBERS

Chace, E. M.—Citrus By-Products Laboratory	141 S. Anderson St., Los Angeles, “
Coit, Prof. J. E.....	College of Agriculture, Berkeley, “
Condit, Prof. I. J.....	College of Agriculture, Berkeley, “
Jaffa, Prof. M. E.....	College of Agriculture, Berkeley, “
Kinman, C. F. U.S. Dept. of Agriculture, 629 23rd St., Sacramento, “	
Murrieta, Juan	Sheriff's Office, Los Angeles, “
Popenoe, Wilson. Explorer, U. S. Dept. of Agriculture, Washington, D. C.	
Scott, L. B. . Pomologist, U. S. Dept. of Agriculture, Washington, D. C.	
Webber, Dr. H. J.—Director Agricultural Experiment Station,	College of Agriculture, Berkeley, Cal.

Third Annual and Sixth Semi-Annual Meeting of the California Avocado Association

Held in Chamber of Commerce Rooms, 128-132 South Broadway,
Los Angeles, May 17 and 18, 1918

THOS. H. SHEDDEN, President
WM. H. SALLMON, Vice-President
H. J. WEBBER, Secretary and Treasurer

MINUTES OF THE THIRD ANNUAL AND THE SIXTH SEMI-ANNUAL MEETING OF THE CALIFORNIA AVOCADO ASSOCIATION

AFTERNOON SESSION, FRIDAY, MAY 17 ANNUAL BUSINESS MEETING

Meeting called to order by President Thomas H. Shedden, who gave an opening address on matters of general interest to the Association.

Minutes of the Second Annual Meeting read and on motion approved.

The first order of business taken up was the consideration of the revised By-laws of the Association, prepared by a special committee, consisting of Messrs. Wm. H. Sallmon, W. L. Hardin, and C. D. Adams, and approved by the Board of Directors. This report was presented and read by Mr. Sallmon. On motion the By-laws were taken up section by section, read, discussed, and adopted; after which, on motion by Popenoe, seconded by Sharpless, the By-laws, as read, were adopted as a whole by unanimous vote. The revised By-laws, as read and adopted follow:

BY-LAWS OF CALIFORNIA AVOCADO ASSOCIATION

Revised by Special Committee of Board of Directors,

Wm. H. Sallmon, Chairman, C. D. Adams, W. L. Hardin.

Approved by Board of Directors' Meeting at Riverside, March 8, 1918.

ARTICLE I.

Name

The name of this Association shall be California Avocado Association.

ARTICLE II.

Purpose

The purpose of this Association shall be to improve the culture, production and marketing of the avocado.

ARTICLE III.

Membership and Dues

Section 1. Any person interested in the purposes of this Association may be elected to membership by an affirmative vote of two-thirds of the Directors present at a meeting of the Board of Directors.

Section 2. The Secretary shall notify a member of his election and send him a copy of the By-Laws of this Association.

Section 3. The membership fee shall be \$5.00 payable at the time the application for membership is made, and thereafter shall become due and payable on January 1st of each year. Upon election the new member shall be entitled to all publications of the Association for the calendar year in which he is elected.

Section 4. No person shall be enrolled as a new member of this Association until his dues have been paid as herein provided.

Section 5. Only members in good and regular standing, whose dues are paid, shall be entitled to vote at meetings of the Association, and only such shall be eligible to office.

Section 6. The membership of any member may be terminated for cause by a two-thirds vote of the entire Board of Directors, the accused being given opportunity for a hearing before action is taken.

Section 7. Persons who have contributed distinguished service in aiding the purposes of this Association may be elected to Honorary Membership, without dues and without vote, by a unanimous vote of the Board of Directors, or by a two-thirds vote of the members present and voting at the annual meeting of the Association.

ARTICLE IV.

Directors and Officers

Section 1. The government of this Association, the direction of its work, the control of its property and funds shall be vested in a Board of Directors consisting of nine members, three of whom shall be elected by ballot at each annual meeting of the Association and serve for a term of three years.

Section 2. Shortly after the annual meeting of the Association the Board of Directors shall convene and elect by ballot from its members a president, a vice-president, also a secretary and a treasurer, who may or may not be a Director, who shall hold office for one year or until their successors are elected. The office of secretary and treasurer may be filled by one person in the discretion of the Board of Directors.

Section 3. The officers (Art. IV, Sec. 2) shall constitute the executive committee of the Board of Directors; said committee to exercise such powers and deal with such matters as may be referred to it by the Board of Directors.

Section 4. Meetings of the Board of Directors may be called at any time by order of the President, or by the Vice-President acting in his absence, and shall also be called at the request in writing of three members of the board; the time, place and purpose of such meeting to be designated in said call. A majority of the Board of Directors shall constitute a quorum.

Section 5. The Board of Directors shall have the power to fill any vacancy in their number or any vacancy in any office in the Association.

Section 6. It shall be the duty of the Board of Directors when the development of the industry makes it desirable and necessary, to provide for the co-operative marketing and distribution of the avocado crop.

ARTICLE V.

Duties of Officers

Section 1. The President shall preside at all meetings of the members and of the Board of Directors. In event of the absence of both the President and the Vice-President, the members of the Board of Directors may elect a presiding officer for such meeting. The President shall submit to the annual meeting a report of the doings of the Board of Directors and of the affairs and operations of the Association during the preceding year.

Section 2. The Vice-President shall, in the absence or disability of the President, perform the duties of the President.

Section 3. The Secretary, or Secretary and Treasurer, shall be the clerical officer of this Association and of the Board of Directors, and shall have charge of the general correspondence. He shall collect the dues of the members and receive all moneys that may be paid to him by virtue of his office, carefully account for the same and promptly cover them into the treasury. He shall pay out such moneys only by voucher countersigned by the President. He shall make a report of receipts and disbursements at meetings of the Board of Directors and a complete report to the members at the annual meeting of the Association.

ARTICLE VI.

Meetings

Section 1. The annual meeting of the members of the Association shall be held at some convenient period during May of each year; the time and place of such meeting to be designated by the Board of Directors, and ample notice of the meeting shall be given to the membership of the Association.

Section 2. Special meetings of the Association may be called by the President with the approval of the Board of Directors, as occasion may require.

Section 3. Twenty-five members entitled to vote shall constitute a quorum at any meeting of the members of the Association for the transaction of business.

ARTICLE VII.

The fiscal year of the Association shall close on April 30th.

ARTICLE VIII.

Amendments

These By-Laws may be changed or amended at any regular meeting of the Association by a two-thirds vote of all members present at such meeting.

During the discussion of the By-laws, considerable had been said regarding the desirability of holding a mid-winter meeting in order to have an exhibit of winter maturing fruit. A motion was made and seconded that the Directors be instructed to arrange for a mid-winter meeting of the

Association, unless unforeseen conditions should render such a meeting undesirable. Motion made and seconded to change *mid-winter* to *winter*. The amendment prevailed and the motion as amended carried.

The Treasurer reported on the financial condition of the Association as follows:

TREASURER'S REPORT OF THE CALIFORNIA AVOCADO ASSOCIATION

Receipts and Expenditures for the Year, May 11, 1917, to
May 10, 1918

RECEIPTS—

Cash on hand, May 11, 1917.....	\$ 410.41
Dues, 1916	10.00
Dues, 1917	320.00
Dues, 1918	585.00
Sale, 1915 Reports	5.00
Sale, 1916 Reports	15.00
Sale, 1917 Reports	7.00
Sale, extra copies of Circular No. 1.....	20.40
Advertising in 1916 Report.....	7.50
Advertising in 1917 Report.....	60.00
Total receipts	<u>\$1440.31</u>

EXPENDITURES—

General expenses of meetings, etc.....	\$ 91.73
Clerical work	250.75
Stationery and miscellaneous printing.....	119.90
Postage	42.10
Engravings for 1917 Report.....	72.70
Express .....	.63
Total expenditures	<u>\$577.81</u> 577.81
Balance in bank	<u>\$ 862.50</u>

RESOURCES MAY 10, 1918:

Cash on hand	\$862.50
Dues 1917 unpaid	70.00
Dues 1918 unpaid	310.00
Advertising, 1917 Report	72.50
Total	<u>\$1315.00</u>

BILLS OUTSTANDING:

Printing 1917 Report	<u>\$317.50</u>
Net resources	<u>\$997.50</u>

In closing the books in 1917, there was in cash on hand \$410.41, and the net resources were \$647.91. The Association thus enters the next year in much better financial condition than in the preceding year.

The President appointed Mr. B. K. Marvin as auditor to examine the books and report to the Board of Directors.

The next business taken up was the election of three new directors to take the places of Messrs. Wm. H. Sallmon, F. O. Popenoe, and E. E. Knight, whose terms had expired. Moved by Whedon and seconded that President appoint three tellers and that the Association proceed to elect the three directors by ballot. Motion carried.

Tellers appointed: Sherlock, Johnson, and Mather.

Mr. Wm. H. Sallmon was nominated by Mr. Popenoe,

Mr. J. M. Elliott was nominated by Mr. Hart, and

Dr. Lester Keller was nominated by Mr. Lesperance.

A motion was then made that nominations be closed and that the Secretary be instructed to cast the unanimous vote of the Association for the three nominees. The motion carried unanimously and the Secretary cast the vote for the nominees named.

On motion the President appointed the following Committee on Resolutions: Marvin, Adams, and Barber.

Moved by Adams, seconded by Russell that the President and Secretary be instructed to send an appropriate letter of special thanks to Mr. D. G. Fairchild and Mr. Wilson Popenoe, of the Office of Foreign Seed and Plant Introduction of the United States Department of Agriculture, for their prompt and efficient work in the investigation of Guatemalan avocados as requested by this Association. Motion carried.

The President placed before the Association the recommendation of the Board of Directors that the following scientific men in the service of the national and state government who had specially aided the Association, be elected as honorary members of the Association in accordance with action taken at the last annual meeting:

Prof. M. E. Jaffa, College of Agriculture, Berkeley, California;

Prof. I. J. Condit, College of Agriculture, Berkeley, California;

Prof. J. E. Coit, Farm Advisor, Court House, Los Angeles, California;

Mr. L. B. Scott, Pomologist, Department of Agriculture, Washington, D. C.;

Mr. E. M. Chace, Chemist, Department of Agriculture, Washington, D. C.;

Mr. Wilson Popenoe, Agricultural Explorer, Department of Agriculture, Washington, D. C.

On motion, these gentlemen were unanimously elected honorary members of the Association.

No fruit exhibit was arranged for this meeting; the following fruits were shown as interesting samples:

Mr. Whedon, 1 Fuerte fruit stated to be too old;

Mr. Mather, 2 Lyon fruits and 1 unknown seedling;

Mr. Taft, 2 Taft fruits and 1 unknown seedling;

Mr. Rideout, 6 Lyon fruits, 1 Dickinson and 1 Wagner.

Mr. Shaffer displayed a bowl of cactus flowers of several varieties of wonderful delicacy and beauty.

The meeting adjourned at 5 p. m. for dinner.

GET-TOGETHER DINNER

The get-together dinner held at 6 p. m., at the Hollenbeck Cafe, 212 West Second Street, was attended by fifty-eight members and guests of the Association and was closed shortly before 8 p. m. to allow the members to attend the evening lecture. A good friend of the Association who desired his name to be withheld paid the expenses of the dinner and thereby created a much appreciated diversion and surprise.

EVENING SESSION, MAY 17, 8 P. M.

The evening session was given mainly to an illustrated talk on "New Avocados" by Professor Webber, who used as a basis the work and lantern slides of Mr. Wilson Popenoe, illustrating Guatemalan avocados recently imported into the United States by Mr. Popenoe from Guatemala. Illustrations of a number of California varieties were also given for comparison. Mr. E. E. Knight also discussed the subject to some extent and President Shedden gave a very entertaining and reminiscent talk.

FORENOON SESSION, MAY 18

Meeting called to order at 9:30 a. m. by President Shedden. The following program was given as outlined:

"How Far can we go with the Avocado as a Food? Why will People Eat it, and to what Extent?" by Lester Keller, M. D., F. A. C. S., Yorba Linda.

"The Door Yard Avocado, Its Use and Mission," Ernest Braunton, Los Angeles.

"When is an Avocado Ripe? How to Tell a Ripe Fruit," by Mrs. B. H. Sharpless, Tustin.

"Advertising the Avocado," by Mrs. J. T. Stewart, Los Angeles, and DeWitt H. Gray, Fresno.

"Chemical Composition of the Avocado as Applied to Different Varieties, and at Different Seasons," by C. G. Church, Bureau of Chemistry, Department of Agriculture, Washington.

An intermission of fifteen minutes was taken to allow new members to join the Association. Ten new names were secured.

Prof. Condit of the College of Agriculture outlined the free correspondence course on the avocado which is being offered by the University, and stated that full information could be obtained by writing to the University of California, Berkeley, California.

The Association then adjourned for dinner.

AFTERNOON SESSION, MAY 18

The afternoon session was delayed by the Red Cross parade so that the meeting did not convene until about 3 p. m. On calling the meeting to order, President Shedden stated that in view of the circumstances and the necessity of the nation making every effort to assist in the care of its soldiers, it was thought by some members that the Association should make some donation to the Red Cross to show its loyalty to the great cause for which we are fighting. Moved by McLaughlin, seconded by Hardin, Hoff and several others that the association donate \$100 to the Red Cross to be used in relief work. Motion carried unanimously with cheers.

The regular program of the afternoon was then taken up and the following papers presented:

"Why Are the Guatemalan Avocados Best?" by E. E. Knight, Yorba Linda.

"This Association," by Thos. H. Shedden, Monrovia.

"How Do the Citrus Growers View the Avocado?" by C. E. Needham, Glendora.

"Care of the Young Avocado Tree for a Year After it Leaves the Nursery," (read by title) by Wm. Hertrich, Alhambra.

Question Box.

Mr. Kinnman of the United States Department of Agriculture, who is associated with Professor Scott, on request, gave a short talk regarding his work, as did also Professor Condit.

Moved by Needham, seconded by Metcalfe, that the Board of Directors use their best efforts to get the United States Department of Agriculture to establish an experiment station in Southern California to study sub-tropical fruits. Motion carried.

The Committee on Resolutions reported as follows:

Los Angeles, May 18, 1918.

RESOLVED, that the California Avocado Association in its Third Annual and Sixth Semi-Annual Meeting assembled, hereby express its sincere thanks to those who have made this occasion both a pleasure and a profit.

RESOLVED, that the generous donor of our avocado dinner on Friday evening, May 17th, who so modestly withholds his name, be accorded our special thanks.

RESOLVED, that we thank the Chamber of Commerce of Los Angeles for its courtesy in furnishing us this hall without cost.

RESOLVED, that we thank those who have prepared and presented to us the interesting papers which we have heard and without which our meetings would lack their informative character. Especially we appreciate the scientific papers which are possible only through continued research.

RESOLVED, that we thank the retiring Directors whose good work we appreciate and now gratefully acknowledge.

RESOLVED, that we thank the press of Southern California for its aid in publishing the necessary information as to our meetings, making them well known and attractive.

RESOLVED, that we tender our thanks to the thoughtful donors of the beautiful flowers contributed.

Respectfully submitted,

COMMITTEE ON RESOLUTIONS

Chas. D. Adams

Geo. H. Johnson

B. K. Marvin

Moved by McLaughlin, seconded by Dana, that report be received and adopted. Carried.

There being no further business, the President declared the meeting adjourned.

H. J. WEBBER, Secretary.

OPENING ADDRESS

BY PRESIDENT SHEDDEN

Ladies and Gentlemen:

Let us put ourselves into a good frame of mind by all singing one verse of "My Country 'Tis of Thee." It is with gladness I greet you upon this third anniversary of the California Avocado Association. I speak sincerely when I express these feelings, for, at each of our six semi-annual meetings, I have experienced an increasing pleasure, both in anticipation and realization. This is because of our better acquaintance not only with each other, but with that hub and pivot of interest, the avocado,—that tree of knowledge, whose students are becoming, each year, more serious and discerning, in the study of it. More practical understanding of it has been burned into us, this year, than ever before.

The unsuspecting avocado grower surely was handed the "hot end of the poker," but he bravely held on, and thereby found out just how much he could stand. It has been twelve months of courageous struggling, and all that we have done, in the year gone, has been deeply tinged with the red hue of our first year in the world wide conflict. Savage war has loosed hell on earth, and we live in an atmosphere of horror created by the combined barbarity and perverted science of one perfidious nation that has been convicted of trying to steal the world,—while it wasn't looking. How hard it is to talk without touching the war!

Within our own avocado sphere, certain untoward happenings of the year have had a depressing effect upon some whose avocado hearts seem not to grow upon "resistant stock," and, in consequence, these down cast ones are found sitting under the "Juniper tree of sorrow," and weeping because they have no avocados to eat, nor the luxurious price of corn and beans, as a substitute. While the year did seem to hang heavy with disappointments, yet, progress did not stop. It was, and is, going on. They who do not see it may be looking for it in the wrong direction,—in the wake of the flitting dollar. One day, a lady asked me to look at an

avocado seed she had planted in a flower pot, none too large, and which had shown no signs of life. A little examination below the surface indicated a mass of root growth, and in a few days the seed began to make rapid progress above ground. Just so is it, at present, with the avocado. We are not standing up on a ladder, in full view, picking fruit this year, but the far better, and more lasting process of evolution and selection and substitution has been going on, with scarcely an interruption.

Be patient, and soon there will be harvested in California, avocados whose quality and quantity will reward us with keen satisfaction. Reports from all sections give promise that the avocado orchards will not be slackers this year.

Tell it to our dear Uncle Sam who is crying for food to feed the millions who are fighting and dying for humanity's sake. Just here, let me present a hope heartily expressed in a recent letter from the Association's good Washington friend, L. B. Scott, that this Association urge a campaign to have one, or more avocado trees planted in every home garden, where they will grow, in California.

From my heart, I commend to the Association this humanitarian act, and hope the board of directors will take up the matter, and evolve a plan for its accomplishment, and in a way that the Association will be seen as backing it, so as to eliminate any seeming personal interest.

I can see in it a grand move towards popularizing the avocado. Avocado purchasing clubs might be organized in communities, and by buying in quantities, could secure prices vastly lower than those quoted to the purchaser of a single tree. The small avocado owner, multiplied by thousands, would be an important factor in winning esteem for the fruit in the land where it is produced.

Doubtless it would cost the Association and the nurserymen something to do this, but we must, sooner or later, get into training for the inevitable campaign of education, publicity and popularity, to which we are drawing nearer each year. This afternoon session will be devoted to business. The finances of the Association are in good condition, as will be seen by report of the treasurer.

The present membership is 193. A goodly company of pioneers in the industry, but far from being all who are interested in growing the avocado. Conditions during the past year have not inspired recruiting work; war bonds and stamps have been more attractive than membership certificates, but I believe that, later in the season, when the avocado begins to blush in profusion upon the trees, we will be encouraged to begin a drive for new members.

Among important business matters to be transacted will be: Report of secretary-treasurer; new by-laws presented by the board of directors, for adoption; election of certain honorary members recommended by the directors; election of three directors, for a term of three years, and as we, as an association, will soon take our place in the business world, it will be wise to give this matter careful consideration. Also we should be observant to return thanks to any one who has lent us a helping hand, and shown us favor, especially, at this time, to the United States Department of Agriculture, through Mr. Fairchild and Mr. Wilson Popenoe, and to others whose friendly hand is shown.

I call attention to the Question Box, put in a conspicuous place for the reception of questions pertinent to the avocado culture. As far as possible, all questions put in the box, up until close of this session, will be answered at last of tomorrow afternoon session. In the interim, persons will be selected to reply, concisely and quickly, so that time will not be lost.

With a prayer for the diffusion of clear thought upon this assemblage, I now declare the third annual meeting of the California Avocado Association open and ready for the transaction of business.

May 17, 1918.

HOW FAR CAN WE GO WITH THE AVOCADO AS A FOOD? WILL PEOPLE EAT IT, AND TO WHAT EXTENT?

BY LESTER KELLER, AZTEC RANCH, YORBA LINDA, CAL.

This subject has been assigned to me by the program committee.

The answer to it is rather speculative and while some of you may not agree with me in all I say, I shall be recompensed by the thought that the avocado growers will hope I am right in my conclusions.

Every reference to the avocado in countries where it grows to any great extent speaks of it as a staple article of food among the natives.

Sailors, particularly of the old "wind jammers" of the "Tramp" type referred to avocados as "mid-shipman's butter." On long voyages when fresh fruits and vegetables were scarce and scurvy was common, the sailors looked forward to the time with much interest when they would get avocados to eat. Scurvy was unknown when avocados were the chief article of food. One writer says when the stay was long and the chief article of food was avocados, the sailors longed for the time when they might move on where they would have another change of diet. How true this statement I do not know.

I asked a man who has lived years in Mexico how generally the avocado was eaten there and he said: "every one eats them there, even the poorest Indian, and they eat them as long as the season lasts." Seek a Mexican settlement with avocados for sale and the eager manner in which they dig up a coin for the AHUACATE will convince you that the above is not overdrawn.

I asked an engineer employed on the canal if avocados were generally eaten in Panama and his reply was, "there are five thousand whites in the City of Panama and if there is one who does not eat them he is a freak. I do not believe he is there."

I asked Mr. Knight if they were generally eaten in Guatemala and he said, "why, man they live on them."

Mr. Wilson Popenoe, who writes so entertainingly in the Journal of Heredity, speaks of the Guatemalans living on avocados and tortillas and on this diet doing the hardest of work, making long trips with heavy loads. Some of the natives occasionally add frijoles to the avocados and tortillas. In the tropics everywhere from Cuba to the Philippines we find that wherever grown the avocado is a staple article of food among the inhabitants.

If so generally eaten in countries where they are so plentiful, it is logical to believe they will be eaten here when they are more plentiful and people are more familiar with their good qualities.

The taste for them is exceedingly easy to form. In fact, about the only thing necessary to have people like the avocado is to give them a good one in proper condition and show them how to eat it.

I believe the word "salad" has done more to injure the introduction of the avocado than most anything else. We are not a salad eating race, like the French, for instance. The impression has seemingly gotten well established that avocados are only eaten in salads by the idle rich who have cultivated a taste for the things. The people say they are not of the idle rich, they do not care for salads and they have not cultivated a taste for them, so why should they eat them?

A very small percentage of the people in the United States have ever tasted an avocado. In fact, the great majority of them have never *heard* of an avocado.

The following, with some slight modifications, probably, I have heard at least once or twice a week for the past two years, in fact ever since I have been growing avocado trees. "What are avocados? What do they taste like?" I tell them it is a tropical fruit with a taste all of its own that makes mighty fine eating and suggest that they may have heard of it under the name "Alligator Pear." "Oh, is that it? They are those things that sell so high that they make salad of." The salad idea is so firmly rooted that often a look of distrust and disgust plainly shows that they think you are "stringing" them when you explain that salad is a very small part of their use. These are not all tourists nor tenderfeet from back East either. I have had the above repeated by people who have been in California long enough to be called old settlers.

Then we meet another kind who tell you very emphatically they do not like avocados. They bought one and it tasted like soap if it tasted like anything. It is very evident the avocado that was unfortunate enough to fall into such hands was not in proper condition.

When one tastes and tries three times with good avocados in proper condition and still insists he does not like avocados, I advise he consult a specialist about his taster for there is surely something wrong with it.

I was once on a time served avocado sandwiches, so called. I first got a taste of onion, then I detected lemon juice, then my mouth was afire with pepper, then I got a dose of oil and I had not even tasted the avocado yet. My hostess whom I knew very well, indeed, insisted on my having a second helping, for she knew I must be fond of avocados as I was raising them for a living, etc. I told her I was sure fond of avocado sandwiches but I had not tasted any avocado yet. I do not use pepper, I never did like onions and since I was a small boy and had to take oil, I always had a distaste for it. I told her that her avocado sandwiches reminded me of a class in school when a girl was asked to describe a crab. She said a crab is a red fish that swims backward. The teacher told her that a crab was not a fish, it was not red and it did not swim backward, but otherwise she said her description was probably all right.

I am fond of salads and sandwiches when properly made but just why anyone should add oil to the avocado which is already from 12 to 30 per cent fat, or why they should spoil the delightful taste of an avocado with

an onion is more than I can comprehend. I again recommend the specialist. Surely the avocado should not be introduced to the beginner by an onion. Most anything would taste as well under such circumstances.

How should you eat them? Why, most any way so you get the taste of the avocado. Eat them with your other food; eat them with your meat; eat them in your ice cream or eat them on your pie. It can be served nicely with any course from soup to nuts. I prefer mine spread on my bread about like my mother used to spread jam when I was a small boy. Add a pinch of salt if you please, but make the pinch small.

The Guatemalan porter does not offend his stomach by covering his avocado with condiments of all sorts. He breaks off a small piece of his tortilla and scoops out a bite of fruit, eating them together. I envy him.

Professor Jaffa, of our own State University has made a very exhaustive study of the food value of the avocado, as all of you well know who have had the pleasure of hearing him at former meetings. It is high in protein and mineral salts, while its greatest food value is in the large amount of oil. Fats are now scarce and it is doubtful if they will ever be plentiful as they have been in the past. While vegetable oils may not take the place of animal fats entirely, we feel that the avocado comes nearer it than anything else.

So far I have never heard a complaint about the avocado being indigestible but have heard many comments on how easily digested it was. I have found it agreeing with the most delicate stomach. I am positive it is mildly laxative. I should select it as an article of diet in wasting diseases such as tuberculosis. I should consider it of great value in diabetes. While I am not in practice in California and have had no opportunity to test it, I should not hesitate to give it in moderation even in typhoid fever. I look forward to no great distant day when it will be recognized as a great food for invalids, the overworked, the neurasthenic and the dyspeptic. This will be particularly true at the vegetarian sanitoriums. Vegetarians will welcome it as a great addition to their food list.

A few days ago a gentleman came to look over my place and he said, "If I were as enthusiastic as you I would set out a large orchard, but I have seen enough avocado groves in the last week to supply the United States and I feel there will be no market for them at a profit."

I told him he reminded me of Col. Harris of Kentucky who sent his crop of tobacco to New York for sale. The report from the broker as to market conditions gave him some uneasiness and he took it upon himself to go to New York to see about it. His first place to visit was the warehouse. He had never seen so much tobacco in all his life as he saw piled up there. The quantity appalled him as he did not know there was so much tobacco in existence. When he consulted his broker he was told that the market was a little "off" but was coming better and he advised holding for a higher price. His reply was "sell that tobaccker and sell at once." He started for his hotel, but as he wanted to see the city he concluded to walk. He met many people and as he did not know one of them he concluded there were a good many strangers in town. His night was rather restless and being an early riser was waiting at the door when the broker appeared for his day's business. His first question was, "Have you sold that tobaccker?" The broker said he had not but would attend to it the very first thing. "Hold it, hold it," shouted the Colonel rather excitedly. The broker a

little perplexed, inquired the reason for his sudden change of heart. "Well," said the Colonel, "when I went into that warehouse I saw enough tobacker to last these United States ten years, and I said 'sell,' but when I walked up to my hotel I saw enough people to chaw all that tobacker in three days, so I guess I will hold it for higher price."

We have been talking about varieties and methods of culture for the past three years, ever since this association came into existence. We have planted our groves and some of us have fruit to sell, while others are living on expectations, and these expectations we hope will soon be realized. We have reached the place where we will have to be doing some missionary work or our supply will soon be greater than the demand. We must be getting others to try avocados. Remember that learning to eat avocados is like learning to swim. When you have learned once you never forget it. Everyone who learns to like them makes a customer. Those who have learned to eat them will continue to do so but we must educate others that our market will increase as fast as our production. Just how we must go about it, how much is to be done by the individual grower and how much by this association are problems we must work out.

In direct answer to the first part of my subject, "How far can we go with the avocado as a food," I will say we can go the limit. There is no danger people will eat too many of them. Why will people eat it, and to what extent? Well, why does a cat eat cream? The cat eats cream because she likes it and then it is good for her. We may give the same reason why people will eat avocados. People like avocados, or will like them when they get good ones, and that will be the great reason why they will eat them. People will eat many things because they like them, although the food value may be very small. Then they will eat avocados when they find out their great food value. It's easy digestibility and exceedingly pleasant taste cannot help making it popular when its merits are known. We should make its merits known.

"It takes the place of meat," is a slogan that will make many eat it. For the past several years we have been getting away from a meat diet. The present war has so increased the price of meat that more and more are cutting down their amount of meat. Meat will probably never be as cheap again as in the past and many will not go back to a meat diet. Some will still have the feeling that they need a little meat, but if they find avocados make a good substitute they surely will eat them. Avocados will be eaten when the price comes down to real food value. Of course, I hope to sell fruit at the prevailing fancy prices. It is now impossible for the man with a small income to eat them regularly. When he pays \$1.00 or \$1.50 for an avocado he is not getting food value for his money. He buys because he has the price and wants to gratify that craving for something good. Prices will come down some time, but I think it will be a long time until good avocados will sell per pound for less than the price of butter.

People will buy them to the extent to which we educate them, to the extent of our ability to sell them at a reasonable price and to the extent of their ability to raise that price.

WHEN IS AN AVOCADO RIPE? HOW TO TELL A RIPE FRUIT

BY MRS. B. H. SHARPLESS, SANTA ANA

It is not too early in the history of the avocado industry, to agitate the question as to what measures may be taken to prevent the marketing of unripe fruit.

It will probably be some time, perhaps years, before we may hope for governmental aid in this direction, and, in the meantime, the industry may receive irreparable injury, unless the Avocado Association is able to foster a sentiment against offering immature fruit to the public.

Such a sentiment is not only a just protection to the purchasing public but is vital to the life of the industry itself.

We point with pride and satisfaction to the large amount of valuable work that has been accomplished by way of gathering data as to the best methods of propagating and cultivating the avocado, locations best suited to avocado culture, and above all, the elimination, as a commercial possibility, of a hundred or more of the less desirable and worthless varieties.

This work has been made possible through the sincere interest and unselfish co-operation of the membership of this association, and I think it is not too much to hope that the same interest and co-operative spirit will solve the problems pertaining to the marketing of the fruit.

Until we, as growers, are able to intelligently answer for ourselves the question, "When is an avocado ripe?" we will frequently be confronted by the question from a skeptical public, "Why is an avocado?"

Nature has chosen to clothe this choice gift to man in sombre garb, and the public buys the avocado, not because of its appeal to the eye, but on the recommendation of a friend, or because he has experienced for himself the pleasure and satisfaction of eating the ripe avocado at its best.

The immature avocado has not the delicate blush of the half ripe strawberry, to catch the eye of the purchaser, or the alluring "sweated gold" of the green orange, nor the flaming invitation of the unripe persimmon.

Gullible man is enticed again and again to buy these acid, puckering, disappointments, because of his inherent conviction that beauty cannot be false, but one flat, insipid avocado that has been rushed into the market prematurely will make him wary of the most tempting display her worthy sisters can make, in their modest gowns.

With some varieties of the avocado, the immature fruit mellow even after taken from the tree and reaches the public in a very nice condition in so far as appearance is concerned; the flat, watery flavor or "cucumber flavor" being the only evidence that it was picked too soon.

With other varieties the skin assumes a withered, wrinkled appearance, while the flesh mellow even, as in the fully ripe fruit. Others never become mellow when taken from the tree too soon but, after a few days become leathery, tough and inedible.

In determining when an avocado is ripe, there are three different methods that suggest themselves as being helpful. Color, analysis and the dropping of fruit.

The blossoming and fruit setting season of a single tree extends over a period of from two to four months, and the marketing season of a single variety may be extended over a period of several months, where one is able to distinguish the ripe from the immature fruit.

One can readily see that the avocado that changes color as it ripens, has an advantage in this respect.

We furnished one firm with fruit from the original Sharpless tree, from October to February, each fruit reaching the consumer in its highest state of perfection. I know of no method whereby this could have been done, except through the selection made possible by the change of color of the ripening fruit.

Where the grower cannot be guided by color, chemical analysis is of great assistance in determining when to harvest his fruit.

The immature avocado is low in fat content and some growers have made the mistake of placing the bulk of their crop on the market early in the spring when the analysis showed a very low percentage of oil with its correspondingly poor flavor, while fruits allowed to stay on the tree a few months later were of good flavor and showed by analysis, a satisfactory amount of fat.

An analysis test would not be conclusive, except where a number of fruits were used in each monthly analysis.

The dropping of fruit is another indication of ripe fruit, although, perhaps, not a valuable one, as the better commercial varieties do not drop their fruit very readily.

As with the pudding, the final and conclusive test of the ripe avocado is in the eating, and in such a test I consider myself an expert, having had a table acquaintance with the avocado for over twenty years. But I am conscious of the fact that such information as I am able to offer on "How to tell a ripe avocado before it is taken from the tree," is very incomplete, as my experience in harvesting avocados has been limited to a few varieties.

WHY ARE THE GUATEMALAN AVOCADOS BEST?

By E. E. KNIGHT, YORBA LINDA, CALIFORNIA

Mr. President, Members of the Avocado Association, Ladies and Gentlemen:

When the Program Committee requested me to say a few words to you and gave me as my subject, "Why are the Guatemalan Avocados Best?" I thought, what is the use? I have been answering that question for the last four years, but sometimes it is necessary to repeat a truth many times to have it fully accepted.

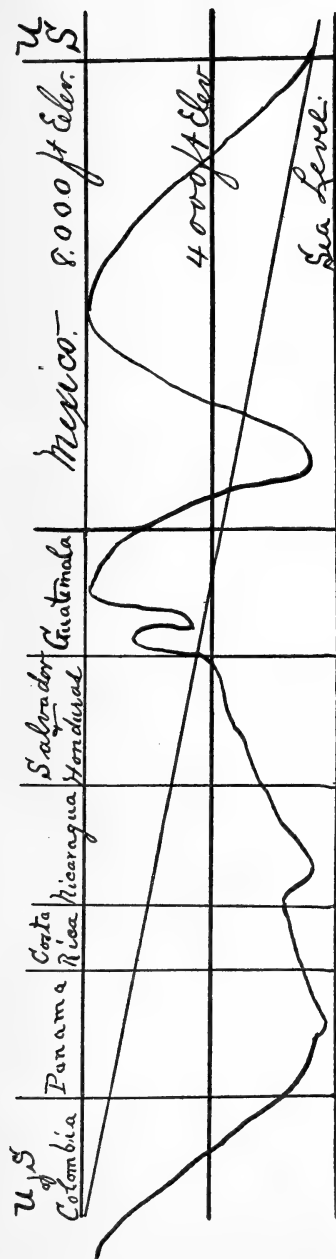
I have lived in California a little over four years and during that time I have seen you start from seedling avocado trees, come down through Ganter, Harmon, Val-de-Flor, and up to your list of eight. List of eight, how much better that is than a list of one hundred and fifty-eight. That step was the first big advance towards the betterment of the avocado industry in this state. This association owes a debt to Prof. L. B. Scott for the help he gave us at that time.

To many that list of eight may seem to be near the final solution of the question of varieties but it is not. It is only the first step, and one that was delayed longer than it should have been. I am satisfied that there is not a single variety in that list that will be propagated commercially, ten years from today. We shall have better ones before then. As time goes on we shall have gained in knowledge. The question of varieties is too important to be settled by the self interest of one or one dozen men. We must produce the best if we are going to make a success of the avocado.

In July, 1914, I landed in San Francisco with the first genuine Guatemala Avocado varieties ever imported into this state. These varieties came from the highlands of Guatemala where many of the finest avocados in the world are found. Two years ago this association through the help of Dr. H. J. Webber, succeeded in having the United States Department of Agriculture send Mr. Wilson Popenoe, one of its best explorers, to the Republic of Guatemala to have him report on the avocados found there. After sixteen months of explorations, Mr. Popenoe has made his report, which will be found in the proceedings of this association for 1917. Mr. Popenoe's report bears out all the claims that have been made as to the wonderful avocados found in Guatemala. Not one fault is found with the best of the Guatemalan avocados in any part of this article. In summing up the best Guatemalans as compared with the best found in the United States, he says: "The flesh is of a deeper yellow color, smoother, more buttery texture, and richer flavor than in any varieties yet known in the United States." (Page 117 Cal. Avocado Report for 1917.)

This report of Mr. Wilson Popenoe's will have more influence on avocado varieties in California than any writing to date. In his statements he is frank and conclusive. His explorations were extensive and thorough. He does not mention the excellent shipping qualities of the genuine Guatemalan avocado. The ability of these varieties to stand up under the severe handling is not due as much to the thick skin as to the peculiar construction of the skin which is of a woody nature. Any avocado, whether thick or thin skinned, will ship well for a week or ten days from the date of picking. That is all that is required today, but within a few years, more or less fruit will have to be placed in cold storage to hold it. When the cold storage fruit comes out for re-shipment, then the genuine Guatemala can be handled with much less loss.

The best varieties of avocados are always found at high altitudes. Each isolated highland seems to produce a class of avocados different from all the others.



Free hand drawing giving approximately the elevation of tablelands from the Rio Grande to the Equator.

Americans as a rule, know little about the countries south of the Rio Grande.

You will note two distinct table lands that run from 4000 to 8000 feet in elevation. The diagonal line is supposed to represent more or less the same climatic conditions throughout its entire length. No superior avocados are found south of Guatemala until Colombia is reached. This sketch shows why. The fame of the avocados grown in Guatemala has for years been proverbial, still no genuine Guatemalan varieties were found in the United States, until within the last four years. Soon I hope we shall have many more varieties from Guatemala to make our selection from, as Mr. Popenoe has successfully introduced twenty-three varieties of the best found there.

The United States Department of Agriculture is the highest authority we have when it comes to introducing new varieties.

It has no axe to grind. It neither buys or sells. It is always cautious about making endorsements, but when it does endorse, you may be satisfied it is sure of its grounds.

Why are the Guatemalan avocados best? Here is your answer: "The flesh is of a deeper yellow color, smoother, more buttery texture, and richer flavor than any varieties yet known in the United States."

CARE OF THE AVOCADO TREE FOR ONE YEAR AFTER LEAVING THE NURSERY

BY WM. HERTRICH, SAN GABRIEL, CAL.

Mr. Chairman, Ladies and Gentlemen of the Convention:

The following suggestions regarding the care of the young avocado tree are principally for amateurs who are about to plant their first avocado tree.

Do not be discouraged with your first attempt to grow one of the most delicious fruits in the world's market today. During the last few years of my observation on avocado planting I have noticed a great many ways of handling young trees just from the nursery, especially among amateur planters and some of them had great success, while others had just as great failures. In the first instance all of the credit was claimed by the planter; in the second, of course, the nurseryman was blamed, the trees being considered no good. Most of us know that not all of the nurserymen who sell avocado trees are angels, but, however, there are plenty of reliable firms, who are not only willing to sell good trees true to name, but will also give information regarding the planting and taking care of them, provided that the buyer can inform him as to the condition of the surface and subsoil in which he wishes to plant, and if possible the location.

It has been repeatedly stated that the avocado tree will stand all the water one can give it and the more given the better it will grow, but this is not true only under the right conditions, for it has also been proven that the avocado can be grown with very little irrigation. However, neither of the above statements should be used as a basis for planting young trees without first taking into consideration the local condition of the soil, be it for orchard or door-yard planting.

Far the best time to transplant young avocado trees just from the nursery is in the Spring as soon as the ground is warm enough to encourage root action, regardless of the fact that the stock was previously established in cans, boxes, or had been dug from a nursery row. Established plants, which have been kept in the open for some little time before planting will require no special protection upon planting, but plants which have been kept in a lath-house or shade of other nature should be protected for the first few months from the strong sun's rays. If no protection is given and a few warm days should follow the planting the tender foliage would become burned and even the soft bark would be cooked. Young trees, which have been growing in the nursery row, upon being dug and balled should be placed in a shady place, either under a tree, a shade house, or the like, so as to get over the shock of transplanting as soon as possible, and when planting out such trees, it is much better to shade them for the first few months.

Small budded trees to 2 feet high are usually taken up without pruning back the tops, but larger trees, two to five years old will have to be pruned back severely so that they can be handled in small boxes. It is these trees which are liable to sunburn very easily and not only the leaves, but the soft limbs as well. Besides having a little shade to protect them it is well to whitewash the trunks and limbs.

If young avocado trees are planted in sandy or loamy soil with no hard-pan for subsoil, a hole about three feet in diameter, or square, if you prefer, and three feet deep should be ample to give it a good start. If convenient and means are at hand the planting of avocado trees in poor soil should be as follows: Dig a hole three feet deep, place in the bottom twelve to eighteen inches of manure, if possible well decayed, tramp down firmly, place from six to eight inches of surface soil on top of the manure and firm down, then place the tree and fill in with surface soil. Use the soil which comes from the bottom of the hole to make the basin around the tree for irrigating. If old compost is to be had a good plan is to use it half and half with the soil for back-filling the hole, but it is not advisable to use fresh, strong manure, or commercial fertilizer too close to the roots. If the soil is light and has good drainage there will be no danger of over watering, but if heavy clay or adobe soil is present the hole should be dug even larger than above mentioned and old compost should be mixed thoroughly with the soil in back-filling, which will act as a good pulverizer. Any layers of hard-pan should be well broken up and this can sometimes be easily done by the use of powder. The irrigation of trees planted in heavy soil is more of a trick than that of those planted in light soil, in other words it is possible to completely drown the trees. Some clay and adobe soils are very slow in allowing the water to penetrate, and under such conditions, if irrigated too often without examining the soil, as to its need, you will form a death trap for the newly planted tree, because the loose soil which has been used in back-filling will take up a great amount of water and with insufficient drainage for the surplus the soil is apt to get sour. Such soil not only prevents the growth of the young roots, but injures the old ones as well and soon the tree takes on a yellow look and very often dies.

To sum it up all that is really necessary in planting the young avocado tree is to take into consideration the local conditions and then use common sense in the application of water. If the young trees have been shipped any distance and have become dry in transit or from any other cause, they should be thoroughly watered before planting.

In making basins for summer irrigation it is a great mistake to make the funnel or crater-like affair with its lowest point directly around the trunk of the tree; it is much better to make a circular ditch around the tree, leaving at least six inches of high ground around the trunk of the tree and as the tree grows the basin should be made proportionately larger. All basins should have some sort of a mulch covering to keep the moisture from evaporating and at the same time to protect the ground from baking.

All young trees should have a stake, for the first year at least, placed on the south to southwest side to act as part shade for the trunk. If the trees are planted during the dry summer months it is advisable to fill the holes with water before planting, which not only gives reserve moisture in the bottom but helps in determining the condition of the subsoil as to drainage by the length of time it takes to disappear.

THIS ASSOCIATION

BY THOS. H. SHEDDEN

The subject assigned to me sounds like a prospectively dry historical sketch coming. But, cheer up; it is not so; for, while rapidly making history, the years of the California Avocado Association are, as yet, too few to inspire the pen of the historian. A great life is only, just now, unfolding before our wondering eyes. Its precious babyhood has been nurtured by devoted hearts and hands that have lovingly lifted it out of its swaddling clothes; soothingly led it through its wheezy times of colic, measles, mumps, whooping-cough and kindred concomitant troubles of tender years,—which experts teach us is the only safe time to have 'em,—and now, upon this 1918 anniversary, presents it as a little three-year-old beauty, which, for accomplishments, will take the blue ribbon at any horticultural baby show in California.

'Way back in the spring of 1915, we were given a pen portrait of it, by its honorable, and handsome father, Edwin G. Hart. Oft times, you know, fond parents will, for comparison, secure a picture of the developing child, each birthday, until the twenty-first. In like spirit, I presume, another picture has been ordered upon this, its third birthday. These infantile remembrances will be of interest to glance at, occasionally, as the years roll on towards its majestic stature of maturity.

The avowed purpose of "This Association," as stated in its fellowship agreement, is: "The improvement of the culture, production, and marketing of the Avocado."

Have members, all, discerned the keystone of this arch which rises over the portals of the beautiful structure we are entering in California?

Not long since, while conversing with several representative members, upon the scope of the Association's work, I asked if they could repeat exactly its object, as officially declared in the by-laws. They, each one, said it was: "The culture, production and marketing of the avocado."

They seemed satisfied with it; and truly that would be a splendid occupation for any California man or woman, and yet, it requires not a philologist to point out that they entirely ignored the major word of this neatly framed manifesto, viz: "Improvement of the culture, etc," and quoted only the minor words. Two of the gentlemen frankly admitted they had never observed the prominence of the word improvement; the other one said he had forgotten it.

Therefore, for a good purpose, may I here ask all the orthodox members of the audience to slowly repeat, with me, our declared creed: "The purpose of this Association is, the improvement of the culture, production and marketing of the avocado." Thank you. The active word is, improvement; the others are passive.

Let me then, good friends, encircle this fundamental word improvement, with a little wreath of forget-me-nots. I will, as the publicity man would say, "feature it"; as the publisher would order, "box it."

The adopting of this watchword, "Improvement," has laid out for us a lifetime of searching and striving for the best; during which, the findings and provings of science will often seem coldly unsympathetic. Fidelity to our purpose will make all initiative acts and final judgments of "This Association" entirely impersonal. Truth is always so.

We must, in the words of another, "Hew to the line, let the chips fall where they may."

In the continual climbing upward, under this banner of Excelsior, let not our eyes be dimmed by the near vision of dollars, and prejudice, or we may not reach the summit.

There will come times when individual members will have to sacrifice personal feelings. The seed of many an enjoyed fruit of years ago, planted, grown and fondly named as one of the family, and many a cherished avocado idea, theory and practice, will prove but footholds and stepping-stones to something higher in the Association's collective climbing, before it "goes over the top." It is already being done; whole jungles of family favorites and entire free lectures on methods have been permanently "camouflaged," by knowledge gained. Weep not then, tender hearted brother, sister, nor show ruffled feelings when the judges pin not the blue rosette upon that dear domesticated avocado orphan in your home garden. Rather take your part and pleasure in knowing that what you have done is a conscientious workmen's contribution to the building of the grandly looming avocado industry,—a stone in its foundations, a brick in its walls. Rejoice, even though you be not the chosen Steeple-Jack to climb and plant the flag upon its lofty pinnacle.

My disappointed friend, if you still exist, I speak somewhat in sympathy; for if you will come with me to the foothills of Monrovia, I will show you a four-year-old avocado orchard, wherein, among fifty-seven varieties, the planter thereof had fondly hoped to find the "dark horse," but which, during the past year, has been largely mowed down to stumps, for the sole purpose of building thereon, something far better, we hope.

This arch word, improvement, gives "This Association" the "right of eminent domain" upon the avocado industry and its reputation. To emphasize this thought, I beg to quote, and commend to you, a passage from a special report prepared by Mr. Barber, on behalf of the board of directors, in presenting its formal findings in regard to the eight varieties of avocados recommended, which says: "As an association we are morally responsible to the many investors joining the industry, year by year. By our mere existence we invite the investment of their funds in the production of avocados, and they rightly expect our assistance. It becomes our duty to protect them from irresponsible people selling varieties which we know to be unworthy of commercial planting."

Adherence to our principles was what evolved the list of eight varieties, the selection of which has, as far as we are now able, made the present, easy, and the future, free from regrets. It has been as a life line thrown to the buyer who has been sinking, almost out of sight, in a whirlpool of despair. It is a towline to the harassed nurseryman who has been rowing, upstream, on the River of Doubt.

Fellow workers, practically speaking, our present concern has to do with the culture; (be careful not to spell it with a "K"); that of the production and marketing is safely a matter of the future,—and we're not there yet. Let us first take good care of the culture, and the product and selling, and perhaps profits, will be taken care of by,—the middleman.

Loyalty to our principles has, also, gained for us powerful allies: the University of California, and the United States Department of Agriculture. We have now many "friends at court." Both of these great institutions of

science have treated the California Avocado Association as a co-ordinate interest, in matters pertaining to the avocado. Signal examples of their favor have been shown us. Recently, and most notably, on the part of the Department at Washington, this Association has been permitted to publish in its year book, just off the press, a condensation of Explorer Wilson Popenoe's report to the government on his sixteen months successful study of the avocado in Guatemala. We are deeply appreciative of Mr. Fairchild's fine feelings of generosity in thus trusting us with this intensely interesting document, so much earlier than his own chosen time for its promulgation. Its presence in the book will justify any avocado man or woman in California, or Florida, to buy, beg, borrow, or pilfer from Dr. Webber, any copy of it he may have left.

The department has, also, recently shown its further favor and confidence by entrusting some of its members with the propagation of sets of the varieties of avocados secured by Mr. Wilson Popenoe in Guatemala.

All of which confidence in our Association springs from that fidelity to its sacred purpose of *improvement*.

In the lovely land of California, where celestial and terrestrial joys and creature comforts crowd our lives, and overflow to other climes, our gladdened eyes see rapidly rising this sunlit Temple of the Avocado. Let the offerings we bring there be ever of the purest and best, for the health and happiness of our fellow beings, and for the good name of the California avocado, to which, in old time language, "We pledge our lives, our fortunes and our sacred honor."

CHARLES SILENT—AN APPRECIATION

PREPARED AT THE REQUEST OF THE BOARD OF DIRECTORS

BY F. O. POPENOE OF ALTADENA

Judge Charles Silent was regarded by the members of this association as a solid, cornerstone friend of the avocado industry. He believed in its great future. He was convinced of the value of the avocado as a food to nourish generations yet unborn. His love of horticulture and his instinctive interests in all that might bless mankind made him early realize the value of the growing industry.

In turning his attention to the study and investigation of its possibilities, the natural tendency of his generous nature came into full play, leading him to give liberally of his time, talent and money in co-operation with the efforts of the association to cultivate the understanding of the public. Each member of the board of directors soon came to regard him not only as the friend of the avocado, but as a personal friend as well. And I am sure the members of the board can never forget the pilgrimages made to his beautiful foothill home, the Rancho del Aliso, near Glendora. These pilgrimages were red letter days to everyone privileged to make them.

At board meetings and at many other times the Judge's counsel was sought and always freely given.

Beyond his interest in helping to start the young and growing avocado industry, the crowning purpose of Judge Silent's life was the perfect development of Rancho del Aliso. Here, it may be said, was his ultimate



Plate II.

Judge Charles Silent
Pioneer Avocado Grower.

effort to impress himself, his feelings, and his spirit upon his fellow men. One who had known Judge Silent in earlier years as a busy, absorbed, successful lawyer, might well have wondered at this expression of his finer nature as a lover of quiet, the country, trees and flowers. His purpose was to impress upon all who came to Rancho del Aliso how great and unmatched were the possibilities of open air life in Southern California. The combination of the beautiful and fruitful brought about by him here never failed to lift every visitor somewhat out of himself. Certainly not in California, and perhaps nowhere can be found such expression of refinement and love of the beautiful worked into practical grove and garden. To understand the mass of detail involved in the making of the beauty found there, required not hours, but days of study. The idea of wealth was always subordinate to the idea of pleasure and simplicity. And it may be said that this wonderful thing he carved out, the expression of his inner self, has influenced his neighbors and the thousands who have been fortunate enough to come into contact with it. I believe it was the Judge's greatest pleasure to guide an appreciative friend through his beautiful gardens and over this lovely estate. Here was something he had founded, not alone for himself, but more for others, and it was in sharing their enjoyment of it that he realized his greatest pleasure. It is one of the glories of horticulture that its pursuit may be, and often in practice has been, a matter of unselfish enthusiasm. In Judge Silent this tradition was well exemplified. His understanding of nature and of the manner of working with nature, was of a rare order. And to the keen and understanding eye, the impress of his wonderful ability and richness of character upon Rancho del Aliso may be seen copied in varying degree and shading elsewhere in Southern California, perhaps a thousand times.

The Avocado Association has lost in Judge Silent a member who has long stood high in their regard. But his work is not lost, and the memory remains of a consistently wise, helpful and generous comrade and friend.

RESOLUTIONS ON THE DEATH OF CHARLES SILENT

ADOPTED BY THE BOARD OF DIRECTORS OF THE CALIFORNIA AVOCADO ASSOCIATION

It was with feelings of profound sadness and regret that the members of the California Avocado Association learned of the death of Judge Charles Silent, who entered into rest at his home in Los Angeles, California, on December 14th, 1918.

Judge Silent was a charter member of this Association, a member of its first Board of Directors and served from 1915 to 1917 as second Vice-President.

We mourn the loss of a kindly gentleman, a wise counsellor, a useful experimenter and an earnest student of the avocado.

Resolved that a copy of this minute be spread upon the records of the Association and be sent to the sorrowing family, and that a photograph of Judge Silent and an appreciation of his life be printed in our Annual Report.

Minutes of the Fourth Annual Meeting of the California Avocado Association

Held at Hotel Maryland, Pasadena, California, Friday and Saturday,
May 9th and 10th, 1919.

WM. H. SALLMON, President
J. M. ELLIOTT, Vice-President
W. L. HARDIN, Secretary and Treasurer

FRIDAY FORENOON—BUSINESS MEETING

President Sallmon presided.

The Minutes of the Third Annual Meeting were read and approved.

The Treasurer's Report showed cash on hand, \$808.14, and resources amounting to \$1,336.61. The report follows:

FINANCIAL STATEMENT

California Avocado Association April 30th, 1919

Cash on hand, May 10th, 1918.....\$ 862.50

RECEIPTS—May 10th, 1918, to April 30th, 1919:

Advertising in 1917 Report	72.50
Sale of Reports.....	28.00
Dues, 1917	5.00
Dues, 1918	230.00
Dues, 1919	629.83
Dues, 1920	5.00
Sale of Fruit	18.00
Sale of Flowers	3.70
For overpayment of invoice, check 27.....	.10

Total\$1,854.63

EXPENDITURES—May 10th, 1918, to April 30th, 1919:

Red Cross subscription	\$ 120.00
Printing, stationery, stamps, etc.....	557.86
Express, freight and cartage	9.18
Telegraph and telephone	7.25
Expenses Annual dinner, 1918.....	5.00
Expenses Re Director's Meetings 1 year..	3.00
Liberty Fair	75.00
Filing case	35.00
Operation of lantern, 1918	4.00
Clerical work	230.00

Total\$1,046.49 1,046.49

Balance on hand April 30, 1919.....\$ 808.14

RESOURCES—

Cash in bank	\$ 808.14
1918 Dues unpaid	125.00
1919 Dues unpaid	445.00
	<hr/>
Total	\$1,378.14
Bills payable	41.53
	<hr/>
Balance	\$1,336.61

Moved by Hardin, seconded by Keller that a committee be appointed to audit the books, and report to the Association. Carried. Mr. Barber was appointed.

The Secretary reported on membership, showing a total paid up membership to January 1st, 1919, 191, and additional paid up to January 1st, 1918, 25, making a total of 216.

This Report was discussed by President Sallmon and Messrs Lesperance, Whedon and Hardin.

Regrets that Dr. Webber was unable to attend the meeting were expressed by the Association. Motion made and carried that the Secretary send a letter of sympathy to Dr. Webber.

Report of the Committee on Varieties by Mr. Adams.

Report discussed by Popenoe, Lesperance, Whedon, Spinks, Adams and Barber.

Moved by Popenoe, seconded by Lesperance that the recommendation of the Committee on Varieties to award gold medals be taken out of the Report. Motion carried.

Moved by Whedon, seconded by Lesperance, that the Committee on Varieties be given further time until the Fall Meeting to complete the Report. Carried.

Suggested by Mr. Spinks that the Report include also the thin-skinned varieties which can be grown in places too cold for the other varieties.

ELECTION OF THREE DIRECTORS

Messrs. Spinks and Barber were appointed Tellers.

The members voted on the following nominees: Messrs. Yaggy, Mather, Sharpless, Hardin, Shedden and Mrs. Stewart. The Tellers reported that Messrs. Hardin and Yaggy and Mrs. Stewart were elected.

The President appointed Messrs. Popenoe, Shedden and Yaggy as Committee on Resolutions.

Moved and carried that more avocado stickers "Eat Avocados" be printed.

There being no further business, the meeting was adjourned.

FRIDAY AFTERNOON

The following program was presented:

The California Avocado Association—Its History and Progress
The Commercial Possibilities of Avocado Growing in Southern California

Dr. J. Eliot Coit, County Farm Advisor, Los Angeles

Summary of Reports on Damage from Frost During the Last Winter

Chas. D. Adams, Upland

Six Years Experience with Budded Avocados

J. T. Whedon, Yorba Linda

Report on the Exhibit at the California Liberty Fair

Lester Keller, Yorba Linda

Mr. Taft gave an interesting supplement to Mr. Murrieta's paper.
Other papers were discussed by various members.

The Informal Dinner at Hotel Maryland on Friday evening was a pronounced success. Present at the dinner, 140.

Before beginning the after dinner program, the members, at the suggestion of President Sallmon, drank a toast to the President of the United States.

The following program was then presented:

How Does the California Avocado Association Benefit the Grower?

Who Should Become Members? Wm. H. Sallmon

Future Work of the Committee on Varieties Chas. D. Adams

What Progress is the Avocado Industry Making in California?

. B. H. Sharpless

Influence of the Avocado Industry on the Individual and the Community W. L. Hardin

Advantages of Co-operation Thos. H. Shedden

In What Way Can a Local Experiment Station Benefit the Avocado

Industry? J. M. Elliott

What Price Will the Avocado Command When Sold on the Basis of

the Food Value? T. U. Barber

What I Have Learned About Growing Avocados Lester Keller

Some Scientific Problems Which Remain to Be Solved H. J. Webber

Professor Jaffa responded to the subject assigned to Dr. Webber, who was unavoidably absent.

Short talks were also made by Messrs. Hart, Popenoe and Coolidge.

The program was made especially enjoyable by the happy manner in which President Sallmon presided.

SATURDAY MORNING

The following program was presented:

Hillside Planting of Avocados

J. M. Elliott, Los Angeles

Some Observations Regarding Cold Resistance of Avocados

C. F. Kinman, U. S. Dept. of Agriculture

What About the Market?

Geo. S. McClure, Riverside

The Avocados of Mexico—A Preliminary Report

Wilson Popenoe, Agricultural Explorer, University of California

Proper Maturing of Avocados

Professor I. J. Condit, University of California

Mr. Yaggy read the paper by Mr. Wilson Popenoe, in the latter's absence.

The papers were discussed by various members.

SATURDAY AFTERNOON

At this session President Sallmon handed the gavel to Vice-President Elliott, who then presided.

The Committee on Resolutions reported as follows:

"At the close of its Fourth Annual Meeting and Exhibit, held May 9th and 10th, 1919, at Hotel Maryland, Pasadena, Calif., the California Avocado Association desires to express appreciation and thanks for many kindly acts accorded it upon the occasion.

"First, to the California Hotel Company through Mr. Bertonneau, for its generous treatment and considerate courtesies in so many ways pertaining to the pleasure and success of the meeting.

"Second, to the Pasadena papers and the press of Southern California for extended publicity.

"Third, to the retiring Directors who have worked long and devotedly for the success of the Association, who have given unsparingly of their time, ability and money, and whose efforts have contributed in a marked degree to its success, we extend our good wishes and sincere thanks; and we here feel it proper and necessary to mention also the Board and its Officers.

"Fourth, our hearty thanks are due to those who have prepared and read the papers that have been the chief motive for our meetings. In this formative period of our history, the statements of cultural method, varietal quality, historical data and maturing advice are necessary to our welfare, and we feel that those presented at this meeting constitute an important addition to our knowledge of the subject.

"Fifth, to those who have made up the fruit display, we express our appreciation for a feature of particular interest and value. The display is educational in a high degree, and is not only inspiring to our members, but helps to cultivate the understanding of the public, so necessary to our healthy progress. We feel that those who have shown these valuable fruits have shown themselves to be the especial friends of the Association."

F. O. POPENOE,
THOS. H. SHEDDEN,
A. F. YAGGY,
Committee.

The question of curly root was discussed by Messrs. Popenoe, Mann, Keller and Mrs. Sharpless.

The Question Box was then opened, which afforded an opportunity to discuss a number of interesting questions.

It was suggested that a letter be sent to the Editor of the Country Gentleman relative to an article in that magazine derogatory to the avocado as a food.

Moved by Shedden and seconded that the Association extend its sincere thanks to Dr. Keller and those who co-operated with him, for the valuable work done at the California Liberty Fair. Carried.

On motion the meeting was adjourned.

W. L. HARDIN, Secretary.

THE CALIFORNIA AVOCADO ASSOCIATION: ITS HISTORY AND PROGRESS PRESIDENT'S ADDRESS

BY WILLIAM H. SALLMON, OF SAN DIEGO

All arrangements had been made for holding the Seventh Semi-annual Meeting of the California Avocado Association on October 19th, 1918 in connection with the Liberty Fair at Los Angeles. The program committee, consisting of our indefatigable secretary, Dr. W. L. Hardin, and our energetic vice-president, Mr. J. M. Elliott, had completed their work, having arranged for us a feast of fat things, both as to eating and speaking, at a Get-together dinner and two public sessions filled with promise. The committee on exhibits headed by Dr. Lester Keller had assembled fruit and trees with which to satisfy the palate and the eye, and all was in a state of readiness, when suddenly, out of a clear sky, came the imperative order of the Health Board prohibiting public gatherings on account of the prevalence of influenza. Your president immediately telegraphed the secretary stating that in his judgment, patriotic duty and the public welfare demanded postponement of our meetings and requesting that such notice be sent to the membership. The other officers concurred and notices of postponement were mailed. When the epidemic seemed to be on the wane assurance was given that the Association could go ahead with its dinner and meetings on Nov. 21st and 22nd, but as the time approached conditions again became uncertain, and the secretary issued another notice of postponement. It did not seem wise to convene our gathering when the Liberty Fair was finally held in December, but an exhibit of fruit and trees was then staged under the guidance of Dr. Keller in the space which we had rented in the Exposition building, much literature was distributed and more than a thousand persons tasted samples of avocados which were furnished to them by our Committee. The officers planned to hold a mid-winter meeting at Pasadena in January, but the "Flu" still lingered, and at a meeting of the Board of Directors held at Whittier in February, 1919, it was decided not to hold any general meeting of the Association until the regular annual meeting in May. I feel sure that our members uphold these actions. Inconvenience, disappointment and expense weigh lightly in the balance as compared with the welfare of the nation and the cause of liberty.

While our plans have been upset and the year has been an abnormal one, yet the business of the Association has not been at a standstill. At the beginning of the year the bona fide membership numbered 161. There have been added, chiefly through the untiring and tactful work of our Secretary 55, making a total membership of 216. The Treasurer's report shows that the financial affairs of the Association are in sound condition. Receipts have amounted to \$1,854.63, expenditures including bills amounting to \$536.68 turned over by previous administration \$1,046.49, leaving a balance on hand of \$808.14.

Your directors, who serve without compensation, and pay their own traveling expenses, have held five meetings, three at Los Angeles, one at the Chamber of Commerce in Whittier as guests of Mr. A. R. Rideout, and one at Pasadena as guests of the California Hotel Company. They have continued their studies of marketing problems, classification and

registration of varieties, damage due to frosts, and have transacted considerable miscellaneous business. They have continued the advertising and educational campaign by issuing about 20,000 pieces of printed matter. Among them are leaflets entitled "Are you interested in Avocado Growing?" designed to secure memberships; "The Avocado, Your Questions Answered" covering the inquiries of those who know little or nothing about the fruit, and "The Avocado" a concise and comprehensive epitome by Prof. Condit on the fruit, the tree, climatic requirements, propagation, soils and sites for the orchard, varieties, yields, pests, food value, methods of serving and by-products. This circular, with footnotes referring to the annual reports of the Association where the topics are treated more extensively, will be of value to every inquirer for years to come.

The Board consists of nine members, three of whom are elected by ballot at each annual meeting of the Association and serve for a term of three years. During the past year the board has consisted of the following members, W. L. Hardin of Los Angeles, B. H. Sharpless of Santa Ana, and Thos. H. Shedden of Monrovia, term expiring in 1919; C. D. Adams of Upland, T. U. Barber of Puente and H. J. Webber of Riverside, term expiring in 1920; J. M. Elliott of Los Angeles, Lester Keller of Yorba Linda and Wm. H. Sallmon of San Diego, term expiring in 1921. Of these nine men six were charter members of the Association and all have been students of the avocado for years. What manner of men they are and the extent and depth of their interest in the business you have committed to them will become apparent at this evening's session when each is to speak for himself.

I now propose to review briefly the history and progress of this Association with some comments and suggestions in order to "stir up your pure minds by way of remembrance," to stimulate the interest of new members, and to inform others about the scope and purpose of our work.

The California Avocado Association came into being on May 15th, 1915, at an advertised meeting held at the Alexandria Hotel in Los Angeles. A board of nine directors was named, tentative by-laws were formulated, and at a later meeting the directors elected officers with Mr. Edwin G. Hart as President and Mr. F. O. Popenoe as chairman of the Executive Committee.

The first semi-annual meeting was held at the same place on October 23, 1915. That the audience was largely composed of seekers after knowledge was evidenced by the number who were armed with note-books and pencils. This studious aspect which was noted at the first gathering, has characterized all the subsequent public meetings of the Association. We are students and pioneers of a new and promising industry. There is a marked absence of cranks and faddists among us. The quality of the leaders and their downright serious attention to the business of improving the culture, production and marketing of the avocado, has saved the industry from the danger of degenerating into a fad, and is placing it upon a dignified basis.

The first public meeting was notable for the contributions made by men of scientific standing. Prof. M. E. Jaffa, head of the division of Nutrition of the University of California, gave the benefit of original research on the food value of the avocado. He stated as a result of chemical analysis, that the avocado should not be considered merely as a

relish, but as a food which builds tissue and yields energy. In this respect, the avocado, as a fruit, stands in a class by itself, ranking higher in fat or oil than the olive and so outranking even that fruit with respect to its total food values. The importance of this announcement can not be overestimated. It shows that we are dealing with the most valuable fruit known to man. The claim is not made that the avocado combines in itself all the elements of a perfect food, but that it contains more of the essential elements yielding on the average a far higher caloric value than any other fresh fruit. It should be our business to make this fact known, especially to medical journals and physicians, for it is evident that we are producing and developing a food of high nutritive value which is likely to find its place in the diet, not only of healthy adults, but also of invalids and of the young.

So important has this matter appeared to your directors that they have appointed a committee to prepare a circular on "The Avocado as a Food," and another committee to negotiate with the Rockefeller Institute with a view of having the institute investigate the use of the avocado for medicinal purposes.

Other scientific leaders who contributed to the success of this first meeting were Professor Ira J. Condit and Dr. J. Eliot Coit of the University of California, Dr. H. J. Webber, Director of the Citrus Experiment Station, and Professor A. D. Shamel and Mr. Wilson Popenoe of the U. S. Department of Agriculture. Prof. Condit gave some news items of interest on the avocado in Central and Northern California. Prof. Coit reported on some experiments with shipments, Dr. Webber told of the experimental work with avocados which he expected would be undertaken by the Citrus Experiment Station, Prof. Shamel made a plea for the keeping of individual tree records, and Mr. Wilson Popenoe gave an interesting account of the Avocado in Florida and other lands. The information and inspiration imparted by these men of science was the outstanding feature of this first meeting. At this meeting also Mr. F. O. Popenoe gave a careful study of varieties, listing more than eighty which had been planted in California. An exhibit of thin-skinned avocados, some budded nursery trees of different varieties, and a mid-day luncheon and display of avocado dishes commanded the attention of large numbers of visitors and served to advertise the avocado in first class style. The important step was taken of adopting the name "Avocado" as against the popular misnomer "Alligator pear" and the unpronounceable Spanish "Ahuacate." It was found that the word "avocado" of pleasant sound has long been identified with the fruit and has been adopted by the U. S. Dept. of Agriculture and horticultural societies. Another important step which bore fruit later was the passage of a resolution urging upon the Secretary of Agriculture, the importance of sending a special agricultural explorer to Central America, Mexico and South America to secure and import into the United States all varieties of the avocado obtainable.

The Report of the first semi-annual meeting giving the names of 74 charter members, the papers and actions which have been enumerated, the experience of growers and others in handling trees and fruit, and directions for selecting ripe and satisfactory avocados and preparing the same for the table embraces initial history of which any infant industry might well be proud. The foundations were well and truly laid and we gladly bring our

meed of honor to the pioneers, nurserymen, scientists and growers, the great majority of whom are still our fellow laborers in this fascinating field.

At the second semi-annual meeting held at Blanchard Hall, Los Angeles, April 29th, 1916, fewer papers were presented, and more time left for general discussion. There was a fine exhibit of trees and fruit, the thick-skinned varieties being more in evidence than at the preceding meeting. Prof. Jaffa and his assistants submitted the results of laboratory investigation of the mineral elements of the avocado and avocado by-products, the latter contemplating over-production and the use of waste avocados. Mr. C. P. Taft presented a readable and witty paper on the market value of the avocado, defending present high prices on the basis of the law of supply and demand. Under the caption "From Seedtime to Harvest" Mr. T. U. Barber presented the results of his experience in selection of seed, seed-planting, transplanting seedlings, budding, cultivation, fertilization and pruning. This paper is so full of valuable information and suggestion that it might well be printed as a primer for beginners. Marketing problems were discussed by Mr. Ira C. King of the California Fruit Growers' Exchange. This important subject has been on the program of most of our meetings and has been frequently considered by your Board of Directors. With the increase of fruit it will soon call for some definite co-operative action. Our marketing problem is large and complex. It will require for its solution the best brains we can command. And we are fortunate in having among our number some experienced shippers of fruit who are acquainted with the ways and means which have brought the California Fruit Growers' Exchange to such a high state of efficiency. We must extend our campaign of advertising in order to introduce this little-known fruit to the people and create an appetite for it. We must teach the hotels, restaurants and public how to select good fruit and how to prepare it attractively. We must discourage producers and sellers from offering inferior stuff which may be of temporary benefit to the producer or seller and of lasting injury to the industry. We must study the best methods of packing and shipping so that the fruit may be put upon the market in sound and attractive condition. It is none too early to get busy—far more busy than we have been—upon these problems, for appeals have begun to reach the Association this year from producers who seek our assistance in the marketing of their crop. The revised By-Laws provide that "It shall be the duty of the Board of Directors when the development of the industry makes it desirable and necessary, to provide for the co-operative marketing and distribution of the avocado crop." Barring excessive heat or cold, or other unfavorable dispensation of nature, the time is fast approaching when we shall need a co-operative organization to care for this important matter.

The third semi-annual meeting held at the Maryland Hotel, San Diego, October 30th and 31st, 1916, was all that a convention should be. For the first time we gathered in a meeting place free from noise where the words of the speakers and the ensuing discussions could all be heard and be heard by all. The exhibit of fruit and nursery stock was staged in a separate room which was locked to prevent distraction during the meeting and on the ground floor where it attracted the attention of the public and contained the largest and finest display yet seen of both the thin-skinned

and thick-skinned varieties. The food demonstration was an event remembered with pleasure. During the noon hour, under the guidance of Mr. T. U. Barber, assisted by the ladies of the San Diego Floral Association, more than six hundred people tested the avocado served in sandwiches and salads. The merits of the fruit were thus advertised to many who had never tasted it before. The educational value of such a demonstration in the early stages of our industry should encourage the Board of Directors to provide the necessary expenses for similar advertising projects. For a long time to come the public will need education on such elemental matters as how to tell when the fruit is in prime condition to eat and how to prepare and serve it in such palatable and attractive fashion that an appetite will be created for more. Twenty-six papers were presented at this meeting, all of which were printed in the Annual Report, fourteen of them being read to the gathering. Most of the papers consisted of the personal experiences of growers and of the history of the avocado in other regions. The program was concluded by two lectures with lantern slides by Prof. Condit and Dr. Webber, many of the illustrations being reproduced in the Annual Report. From the wealth of information spread before us at this time, it is difficult to select the papers which call for special comment. From the history of the avocado in other parts of California, in Florida and in distant lands, we glean information of value to ourselves, and from the experience of growers we learn how to avoid mistakes, how to propagate, plant in orchard form, cultivate, irrigate, detect disease, extend the season of ripening and the like. The paper by Mr. F. O. Popenoe on "Growing an Avocado Tree" is a compendium on the subject. Prof. Condit's "History of the Avocado and its Varieties in California" with a check list of all named varieties numbering at that time 143, gave point to the ringing appeal of Prof. L. B. Scott that it was high time to take definite action on the elimination of varieties.

The fourth semi-annual meeting held in the auditorium of Normal Hill Center, Los Angeles, May 18th and 19th, 1917, was devoted almost entirely to a discussion of varieties. The history and propagation of the Sharpless and Monroe, the Wagner, Lambert and Surprise and the Taft were presented in papers by the men who had most to do with originating and propagating these varieties. Personal experiences with these and many other varieties were detailed by growers, culminating in a paper by Mr. W. A. Spinks on "Interplanting and Changing Varieties," in which is a tribute to the nurserymen which deserves to be re-read—and crowned by a masterly recital by Prof. L. B. Scott on the "Comparative Merits of the California Avocado Varieties," which those who heard will not soon forget. The effect of cold periods of weather upon different varieties of avocado trees obtained in statements from fifty members of the Association, was presented by Dr. Webber. The evidence seemed to connect the degree of injury with the water conditions in the soil, the maximum injury, according to reports, accruing to those trees which were suffering for lack of irrigation. Mr. Thos. H. Shedden, ex-president, "poet laureate" and committee of one on what he terms "that animal-vegetable conglomeration 'Alligator pear'," stirred the meeting to risibility with a "partial report of incomplete work" on his "effort to familiarize the public with that gentle and euphonious word 'Avocado'." The program was enriched by three lectures with lantern slides on "The Avocado in California" by Dr. Web-

ber; "Avocado Varieties" by Prof. Condit, and "Methods of Pruning" by Mr. B. K. Marvin, all of which were of such educational value as to call for repetition when reviewed in the light of new information.

The program of the fifth semi-annual meeting held in the Glenwood Mission Inn at Riverside, October 26th and 27th, 1917, was arranged with reference to a general demand for more time than was ordinarily allowed for discussion. Few papers were presented, two symposia, one on "Irrigation" and the other on "Heat Injury," occupying the bulk of the time. The symposium on "Irrigation" led by Dr. Lester Keller, brought out the fact that he stands, almost, if not quite, alone in his advocacy of the constant drip irrigation which he practices on his nine acre avocado grove. The symposium on "Heat Injury" occasioned by the excessive heat wave of June 14th to 17th, was carefully planned by Mr. F. O. Popenoe and established the fact of relationship between the injury done to avocado trees due to heat and the lack of timely irrigation. Strong young trees shielded from the sun during the first summer, provided with a generous mulch of straw and adequate moisture, are, other things being equal, the most heat resistant. Other cultural problems might profitably be treated in this way at our meetings as the symposium and discussion bring out a great deal of valuable personal experience and suggestion.

A special report of the Board of Directors on Avocado Varieties was presented at this meeting. From the beginning your directors have felt that this was the most important problem confronting the new industry. With the number of varieties increasing until some 180 were listed, there would naturally arise hesitation with respect to planting. It was apparent that some action was necessary to stabilize the industry and standardize the fruit. The first president of the Association, Mr. Edwin G. Hart, appointed a committee on the Classification and Registration of Varieties. After thorough investigation of fruit and trees the committee met with the Board of Directors and the whole question was carefully considered, with the result that a list of eight varieties was approved as the best and most reliable for commercial planting in California. The report of the committee as modified and adopted by the Board of Directors is included in the Annual Report for 1917, and was published as a circular. The action of the directors was almost unanimously acclaimed and was immediately productive of beneficial effects. Planters began top-working and rebudding and nurserymen discontinued carrying many varieties for which there was only an occasional demand. To apply the pruning knife to such a formidable list of varieties as existed was a delicate task courageously performed. It was the most singular contribution which has yet been made toward the standardization of fruit and the stabilization of the industry. But the list of varieties adopted must not be considered as final. It was the recommendation of the committee and the opinion of the directors that the list should be revised periodically and brought down to date to keep pace with advancing knowledge. The directors have therefore provided for the continuance of the committee giving the President power to make such changes in its personnel as may seem desirable.

The three published annual reports for 1915, 1916 and 1917, which we have briefly reviewed, contain a great deal more than has been mentioned. There are suggestions of pioneers in the industry which the seeker after knowledge can not afford to pass by. There are articles of general

interest and permanent value not read at any meeting of the Association, such as that on "Exploring Guatemala for Desirable New Avocados" by Mr. Wilson Popenoe, Agricultural Explorer of the U. S. Department of Agriculture. There are charts for orchard planting and photographs of fruit and trees admirably reproduced. These reports, with the forthcoming Volume for 1918-1919, which will contain the record of the sixth semi-annual meeting held at Los Angeles May 17th and 18th, and this, the seventh semi-annual or fourth annual meeting, are the storehouse of knowledge about our industry. They show how very far we have traveled within a short compass of time, and are prophetic of the day hailed by our "poet laureate."

"When thru all the states of our dear Native land,
This fruit, with our orange, shall go hand in hand."

SUMMARY OF REPORTS ON DAMAGE FROM FROST DURING THE PAST WINTER

BY CHAS. D. ADAMS, OF UPLAND

Undoubtedly the directors, in turning over to me the papers received on this subject, had in mind simply a very short summary of their contents as an opening to a general discussion of the frost and its results; since the papers were not numerous and I have, to make up the lack, no harmful personal experience to relate.

The windstorm which occurred the latter part of November, though restricted in its scope, was very severe where it prevailed and did more damage, in those localities than the cold which followed it, later in the season. Those who write from these places naturally report about both the wind and the cold. It would seem very proper that both should be included in our discussion today.

The experience of different growers in different localities, as to which ones of our best varieties proved most cold resistant, most wind resistant, and most heat resistant, during the time they have been Avocado growers, is the kind of information we are all seeking in making up our minds as to what we want to plant ourselves or advise others to plant. The tree, other things being equal, that will best stand up under adverse conditions, is the one we are studying to discover.

Besides methods of protection against frost, wind and heat, brought forward in our discussions, we are gradually learning where we can and where we can not safely plant the desirable Guatemalan varieties. For this purpose we know, as a rule, the foothill sections are the best. In this connection it is interesting and instructive to study the frost effects, at different elevations, in a district of Avocado plantings. Of the letters received, practically all touch on this point.

A writer from Yorba Linda states the frost seemed to have missed all trees on high ground, but my hundred trees on low ground were badly frozen. In the Upland grove situated at the highest elevation no damage. Several hundred feet further down some leaves burned and some young shoots killed. Three or four hundred feet further down, close to the

Santa Fe Railroad, two or three trees not hurt, but all the others of about a dozen varieties had the leaves and young shoots burned and in a few cases about one third of the tree killed back.

A Monrovia-Duarte report first describes the damage done and the quantity of valuable fruit blown off, between Sierra Madre and Glendora, by the November wind storm, which was the hardest continuous wind known there in thirty-eight years. It then gives an account of the effects of the cold. At 1500 feet elevation no damage. At the Sierra Madre elevation the thermometer touched 32, at the foothills just above Monrovia 31. In the upper part of Monrovia 31, in the middle part 28. Just below the town, lower in the valley it went to 22, and away down in the middle of the valley it went as low as 17. At 30 and above no particular harm done. This does not mean we can grow no Avocados except in the higher foothills. We can. Many of the more hardy varieties will do well wherever oranges will, but some of them must have better than the average orange orchard conditions.

We have all the past experience in orange and lemon growing in California to guide us and prevent unwise locations being used for Avocado orchards. Nor need any orange grower be deterred from planting them on his property, if he will select the varieties proper for his location.

SIX YEARS EXPERIENCE WITH BUDDED AVOCADOS

BY J. T. WHEDON, YORBA LINDA

Of the twenty-one varieties planted in 1914, the Fuerte is the only one proving entirely satisfactory. The fifty Fuerte trees averaged \$10 per tree the second year from planting, and the third year, (which included the June hot wave of 1917) \$6 per tree. The fourth year, at the time of this writing, October 1st, has every appearance of being far better than either of the other years.

The Dickey is the only other of the twenty-one varieties planted that has contributed one cent towards its keep. The Harman, Ganter and all other thin skin varieties have been top worked to commercial varieties, principally the Fuerte.

The Taft is acting very queerly. At two years of age quite a number blossomed and set fruit, and four of them matured from one to two fruits each; at three years of age several of them had from ten to one hundred fruits set, but the June hot wave got away with all of them; this year sixty per cent of the trees blossomed and set fruit, some of them as high as one hundred to a tree, but for some reason they have all dropped except about two dozen fruits on the sixty-eight trees.

The Atlxco set quite a number of fruits, but they have all dropped except six. The Sinaloa, Popocatepetl and Volcan have not even blossomed yet after four years of care. The Murrieta, after standing practically dormant for four years, took a notion to grow this spring and now looks as though it might make a tree. Have two Millers. Both are fruiting this year. Trapp set several hundred fruits, but all dropped except one. The Perfecto, planted in 1916, has seven very nice fruits on it this year. The Rey and Linda, planted in 1915 are both fruiting.

The Linda top worked on Chappelow and Atlixco three year old stock in 1916 are fruiting nicely this year, and fruit weighing five to nine ounces cut open shows an unusually small seed; fruit now hanging on the trees weigh from twelve to twenty-eight ounces, seven months growth. Some complain about the Linda drooping so badly that it is difficult to get a tree out of them. My Lindas have made good growth and I am inclined to think that if those having poor success had followed the instructions, given by practically all experienced horticulturists, of digging a good sized hole and filling it with top soil, it might have been different. Howard and Smith, in sending out their Los Angeles rose, send printed instructions with each shipment, directing that the hole should be two feet in depth by three feet in diameter, and eight inches of cow manure well tamped in the bottom of the hole, with eight inches of top soil on the manure, also well tamped. You are then ready to plant the rose. What is good for a rose is also, in my judgment, good for a tree. I have been using alfalfa in the bottom of all holes dug the past two years, and find it works very nicely. If I don't mistake my guess, the Linda will be wearing a blue ribbon before she is much older. The Lyon with me seems to be healthy enough but a poor grower. Buds put in last summer (1917) made a growth of three to four inches, and instead of putting out a good growth this spring, did nothing but blossom. Even since rubbing off the blossoms they have made very little growth.

Sharpless top worked on four year old stock last year are making good growth. Have all of Mr. Knight's Guatemalan varieties, but was not fortunate enough to get any of Mr. Wilson Popenoe's Guatemalan budwood. I do not envy the man's position who made the distribution, for it is simply out of the question to please everyone and those who did not get the budwood no doubt think that they ought to have had it, instead of some of those who received it. However, I think the Bureau of Plant Industry of the Agricultural Department would have given better satisfaction all around by allowing their men in the field to make the distribution, as they know every grove and prominent avocado tree in the state and their owners; they also know the location where the buds would do the best, and that of course is what the Bureau wants.

Dr. Coit, Farm Adviser for Los Angeles County, made some very sensible suggestions in his article on bud selection, published in the November 1917 issue of the California Citrograph. I would add to those suggestions, for the avocado, that the buyer, where he has sufficient knowledge of budding, be permitted to cut his own budwood, as he then not only knows that he is getting buds from a good bearing tree, but also good bearing wood. The importance of selecting budwood from good bearing trees, as taught by Messrs. Shamel and Scott, cannot be impressed upon the buyer too strongly. Budwood has been cut from only twenty-five of the fifty Fuerte trees I planted in 1914; the other twenty-five, while bearing, have not done nearly so well, and ten of them I presume should be classed as drones. Practically all nurserymen are now cutting their budwood from bearing trees, but there are some, especially those with little knowledge of the business, getting their budwood wherever they can get it cheapest, regardless of quality. Of course in the beginning all budwood had to be taken from non-bearing trees, but judging from my own experience as above stated, one half of such buds are liable to produce poor bearing

trees, if not drones. We are fortunate in having budwood brought to us by Messrs. E. E. Knight and Wilson Popenoe, cut from the very best bearing trees in Guatemala.

Quite a number of writers have classed the avocado as a gamble. It certainly was in the beginning, but there are now enough proven varieties on the market to put it on a par with any other horticultural business. If the pioneers had had the information before them that circular No. 1 issued by the Association now gives, it would have saved them many a dollar. There may be several varieties named in this circular that will have to give way to new and better varieties, but in the writer's opinion the Sharpless and Fuerte will always remain on the standard list.

Growers selecting varieties to plant should be governed by the locality they are living in. Where they have killing frost it is a loss of time and expense to plant the tender kind, unless they are prepared to protect them for the first two or three years. It is also just as important to know that the nursery stock you are buying has been budded from good bearing trees as it is to select the variety, and I know of no better way, in making your selection, than to buy of nurserymen who keep a performance record of the stock they are budding, which shows the row, number of tree, and in large groves the block, the buds are taken from. The Bureau of Plant Industry of the Department of Agriculture has men in the field who keep a check on all performance record groves, which gives the buyer that additional protection.

REPORT ON THE EXHIBIT AT THE CALIFORNIA LIBERTY FAIR

BY LESTER KELLER, YORBA LINDA, CALIF.

As chairman of the exhibit committee for the Liberty Fair I wish to report.

When the Fair was first to be opened we had a splendid display of fruit collected, mostly of the thin skinned varieties, due to the fact of the June heat of 1917.

When the opening of the Fair was announced for the second time we had collected a somewhat smaller exhibit but again we were doomed to disappointment.

When the Fair did open on the third attempt we had but few of the thin skinned fruits but a nice display of the thick skinned fruits, most of which were immature.

We had fruit exhibited by Messrs. Baker, Walker and Wagner of Hollywood, West India Gardens, Hardin of Santa Monica, Rideout and Gano of Whittier, Shedden of Monrovia, Spinks of Duarte, Adams of Upland, Sharpless of Tustin and Whedon, Knight and Keller of Yorba Linda.

When the Fair opened we commenced answering questions and explaining about the Avocado and never stopped until the Fair closed, working from 10 A. M. till 8 P. M. daily. We distributed literature gotten

out by the Association and also some for nurserymen. The interest was so great that I believe I am safe in saying that we had more people at the Avocado booth than all the rest in the building combined.

To answer the question, "What does it taste like?" that was asked a few hundred times, Mrs. Keller felt compelled to commence serving samples. This was so big a job that we found it hard to get suitable fruit for serving. We had a box of Ganters given us that had been in cold storage, and also some seedlings and some prematurely ripe Fuertes, but most of those served were Pueblas from my own grove. Over ten thousand samples were served, they being small as a matter of course.

We were relieved from time to time by various members of the Association and I now recall Messrs. Shedden, Knight, Sherlock, Elliott, Hansen, Wagner, Rideout, Hardin, Mann and Adams. Mrs. Mann, Mrs. Hardin and Mrs. Boardman rendered valuable assistance.

We tried to keep a fairly close tab on the troubles people had and the complaints made about avocados. Some few complained about over-ripe fruit having been sold to them. Many complained of immature and hard fruit, while many said the fruit they bought was all seed. Several said they tried to eat the seed as that was all there was in it. There was a general complaint about the fruit-men not being able to give any reliable information about quality, varieties or condition. They said the fruit men always said the fruit was ready to eat as sold. A few said no difference what variety was asked for the fruit man had it if he had only one fruit in stock. Dozens said they had tried one but did not like it as it was hard and tasted like hard soap. When a sample was served them it usually brought forth a lot of exclamations and questions. It was so different from the one they had tried. A number of real enthusiasts said they had given up trying to get good fruit in the market.

This universal complaint of the beginners convinced me that if we are to succeed in introducing avocados to the public we must have some one to handle fruit who *knows avocados*. He must be a man able to give customers reliable information as to variety, quality, time to be eaten, etc. He must be in a position to guarantee fruit to be *just what it is sold for*. Whether it be first, second, third or fourth class fruit he should make it stand up to grade.

Thousands came who had never tasted an avocado, hundreds who had never seen one and thousands asked the question, "What is an avocado?"

HILLSIDE PLANTING OF AVOCADOS

By J. M. ELLIOTT, OF LOS ANGELES

A request from President Sallmon that I tell the Association my experiences of two and a half years as an avocado planter on hillside lands, is the cause of this attempt. Please remember that I am making suggestions, not giving advice, for the coming years may prove that our experiments should have been conducted on very different lines.

Many prospective growers on hillside will confine their activities to property already owned, but to others who expect to acquire sites I would

say that probably the limit of the steepness of the natural slope should not exceed thirty per cent, except for a short distance.

The so-called contours on which the trees are to be planted are in reality terraces and should have a slope along their length of from one to two and a half per cent, the greater the distance the water has to run, the greater the fall. The ground should be laid out by some competent person and if it is of any great extent, a surveyor's instrument is almost indispensable. A reversible hillside plow should next be run along the line of stakes set and, when a few furrows have been plowed, V shaped and other grading tools will be called for to complete the work. It is wise to make the terraces almost as wide as the lay of the land will permit, for the cost (which may well be considered as part of the land) is less if the work is done at one time and especially before there are any trees to interfere. When the terraces are made the slope should be carefully tested by running water and all inequalities remedied. If possible, a delay in planting until after a winter's rains have settled the ground and brought out the defects will be of advantage. Any neglect to attend to the perfecting of this slope will increase the expense of irrigation materially. Roughly, the terraces may be made thirty feet apart. The lay of the land will sometimes bring two terraces much nearer together or much farther apart than this distance, but where they approach nearer than twenty feet, one may be discontinued and when they draw apart as far as—say fifty feet—a new terrace, short or long as the ground permits, may be inserted.

Water is preferably supplied from a large service pipe running along the upper terrace and from this smaller pipes should cross the lower terraces at their highest point, where a tap should be provided. Under a sixty foot pressure, a three quarter inch pipe should be sufficient for the lines crossing the terraces. If these terraces are longer than three hundred feet it will be necessary to have an additional up and down supply pipe and tap.

When the ground is considered ready for planting the trees should be set out at a point on the terrace about where the original surface of the ground lay, thus giving to the growing roots the benefit of a larger supply of well cultivated top soil. However, should the hillside be quite steep, it is well to plant the young tree from six to fifteen inches inside the line of the original surface.

Concerning the important point as to how far apart on the terrace the trees are to be planted, the principal consideration is whether the tree has an erect, medium, or spreading habit. The extremes I should say would be about fifteen feet for trees like the Lyon and fifty in the case of those like the Taft. Some growers may choose to plant alternately different kinds quite closely, with the intent of eventually eliminating the less desirable.

The proper irrigation seems to be by furrows. Where the terraces are so wide that the water can be run both inside and outside the line of trees, this plan may be resorted to, care being taken to raise the outer edge of the terraces. Where the hillside is so steep that the terraces are necessarily narrower, one or two furrows should be run inside the line of trees. If the terraces have been carefully graded, the water may be regulated so as to merely run slowly and only in such volume that on arriving at the end of the terrace there will be no waste.

Hillside lands run great risk from wash in heavy rains. At any point where water is liable to congregate some run-off must be provided and cement or other pipe so placed that a slide may be unlikely. In this connection alfalfa, lippia or some other growth with roots which have a tendency to hold the soil will be advantageous. At this point it may be well to say that a good supply of lima bean straw as a mulch is exceedingly useful on the terraces in case of heavy rains in helping to control the unruly rush of storm waters. Not only this, but the mulch will act as a saver of irrigating water by preventing evaporation of moisture, it will obviate the necessity of much cultivation, prevent the growth of noxious weeds, and finally by its decay will provide the humus and nitrogen so necessary for the replenishment of the soil, which will naturally be exhausted by such vigorous feeders as producing avocado trees.

The care of hillside planting is more expensive than that of level or nearly level ground and because of the inability to plow up and down the hill, more hand work is necessary. In order to obviate this last, I am experimenting in making small terraces between the larger ones, which can be cultivated lengthwise with facility and which will allow the growth of cover and other crops while the trees are young. A friend of Mr. Sallmon, Mr. R. C. Allen, has made a hillside planting by leveling a circle wherever he desires to plant a tree. This basin he filled with mulch and irrigates from above, giving no other care. With a very large supply of bean straw, this might be done on terraces and the slight cultivation now necessary after irrigation be largely avoided.

The protection against frost afforded by many hillsides is very considerable, the thermometer readings varying as much as six degrees on cold, calm nights, where the points of observation differ about 125 feet in elevation. In this connection I may say that the cost of the terraces and the greater expense of cultivating the trees on a hillside, if any, should be looked upon as an insurance against frost, which it is to a very considerable degree, in my opinion.

OBSERVATION ON FROST INJURY TO AVOCADOS

BY C. F. KINMAN, U. S. DEPARTMENT OF AGRICULTURE

In looking over the frost injury evidence in this part of the state, I was pleased to find the avocado orchards in better condition than I had expected they would be, and the same is true of many other sections of the state. The point that impressed me most forcibly was that during the past severe winter the behavior of different varieties in different localities and of individual trees of the same variety in a given orchard has been decidedly varied. One must be exceedingly careful in his observations and considerate in his praise or condemnation of any given variety. The evidence as found in a given locality or orchard was certainly not sufficient for a stranger in that orchard or locality to rate a variety or individual tree as so much depended upon the local conditions and the treatment that had been given.

The vigor of the tree, it appears to me, has been the principal condition upon which depended its inability to withstand cold, and only after

one is well aware of the condition the tree was in prior to the frost can he judge the normal frost resistance of the tree. Anything that has prevented the tree from making a normal growth has aided the cold in its injurious work. These injuries can, in a large majority of cases, be traced to poor soil, hardpan too near the surface, drouth, severe late summer pruning, cultivator injury, lack of cultivation, etc. For example, in the center of a large planting of three year old Harmon trees, I found ten trees with not a trace of injury caused from the fall in temperature to 10 to 20 degrees above zero at that point, while the surrounding trees were badly frozen back or killed entirely. It developed that the soil in the field in general had practically no humus and both the surface and subsoil dried out badly and became very hard, but the small plat where the ten uninjured trees stood was of dark loamy soil, apparently very fertile and which retained moisture well. This was in a level field where air drainage could not have been responsible for the condition of this isolated spot. I was of the impression that there had been, in years past, a stable or sheep pen on this fertile spot where the trees were much larger than the surrounding ones, but was told that this was not the case.

I found a number of cases where vigorous branches which had been cut back severely during the fall frosted badly.

Numerous instances of cultivator injury to branches have also been observed to have resulted in increasing cold injury. Every leaf on branches which were barked on one side by an implement during the last season's cultivation were killed by the cold entirely; no other leaves on the same tree showing any injury from the cold. Some of these cultivator injuries were so small that one would pass them unnoticed were it not for the frosted leaves. It was observed that not only the condition of the entire tree but even of individual branches determine the amount of resistance to frost.

In view of this, and many other observations, it seems clear to me that with the great diversification of treatment practiced by orchardmen, and the variation in environment which is found from tree to tree, that we are far from having secured sufficient conclusive evidence to allow us to classify correctly the different varieties so far as cold affects them.

That the many conditions for thriftiness that affect so markedly the cold resistance of the tree also affects the time of ripening of the crop is probable. Some varieties have not ripened their crop just at the time appointed for them this season, and it seems probable that ripening days should be correlated with the treatment given the tree to determine the normal ripening period.

Generally speaking, some varieties of the Mexican type have withstood the past severe winter remarkably well; only the tips of the tender growing branches having been killed by the cold. This condition was observed at different points in Sacramento, San Joaquin, and Santa Clara valleys as well as in this part of the state. Where planted at most desirable elevations and sites, trees of this type are given encouragement. While but few, if any, of the varieties of this type are suitable for commercial planting, they promise something for the home garden and many local markets, especially in parts of the state where there is not a demand for the very high priced fruit and sections which are not sufficiently frost-free to make plantings of the more tender kinds an attractive proposition. The West Indian type promises nothing so far for encouraging their planting

except by the experimenter. They have not withstood the cold at all well, and from the appearance of the trees I have seen do not seem to be well adapted to some of the other conditions, possibly the extreme warm period in summer. Personally, I am rather partial to the flavor of this fruit but find few who share my judgment among those who are most familiar with the best Mexican and Guatemalan varieties. Nurserymen should be especially careful to keep their stock plantings free of West India seed.

Among our better known kinds which are recommended for planting, the Fuerte impressed me as withstanding cold much better than the others, and the Taft seemed to be the most severely injured. There appeared to be considerable difference between these two varieties. Other varieties recommended for commercial planting and a large list which are being grown experimentally, or in a small way, excluding some of the thin-skinned Mexican varieties and those from the West Indies, fall pretty well between the two above extremes and appear to differ but little in their cold resistance.

Special care should be given new introductions to prevent them from being eliminated by cold while the trees are young and before the value of the fruit or the cold resistance of the tree has been proven. Mr. Knight solved this problem very satisfactorily on his place during the past winter and his method of spraying trees with water while low temperatures prevailed should be considered by those equipped for it.

In conclusion avocado growers should remember that the weather breaks a record almost every day somewhere and make their plantings and care for their trees accordingly.

THE AVOCADOS OF MEXICO: A PRELIMINARY REPORT

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The outstanding importance of Mexico as a field for the study of avocados and avocado culture is evident at a glance. The great extent of its territory, the immense range in elevation and consequent differences in temperature, the widely diverse soils found in various parts of the republic,—these and other factors combine to produce an almost endless series of environmental conditions. Added to this the fact that avocados are not only cultivated in abundance, but are found also in the wild state, and nothing further is needed to convince the student of avocado culture that here are opportunities for investigation and research such as are offered by no other country in the world.

In the development of the avocado industry in California the greatest factor up to date has been Mexico. Glance over a list of the varieties which have been tested in California, and you will find that the majority of them are of Mexican origin. It is natural, therefore, that the horticulturists of California should be deeply interested in Mexican avocados and avo-

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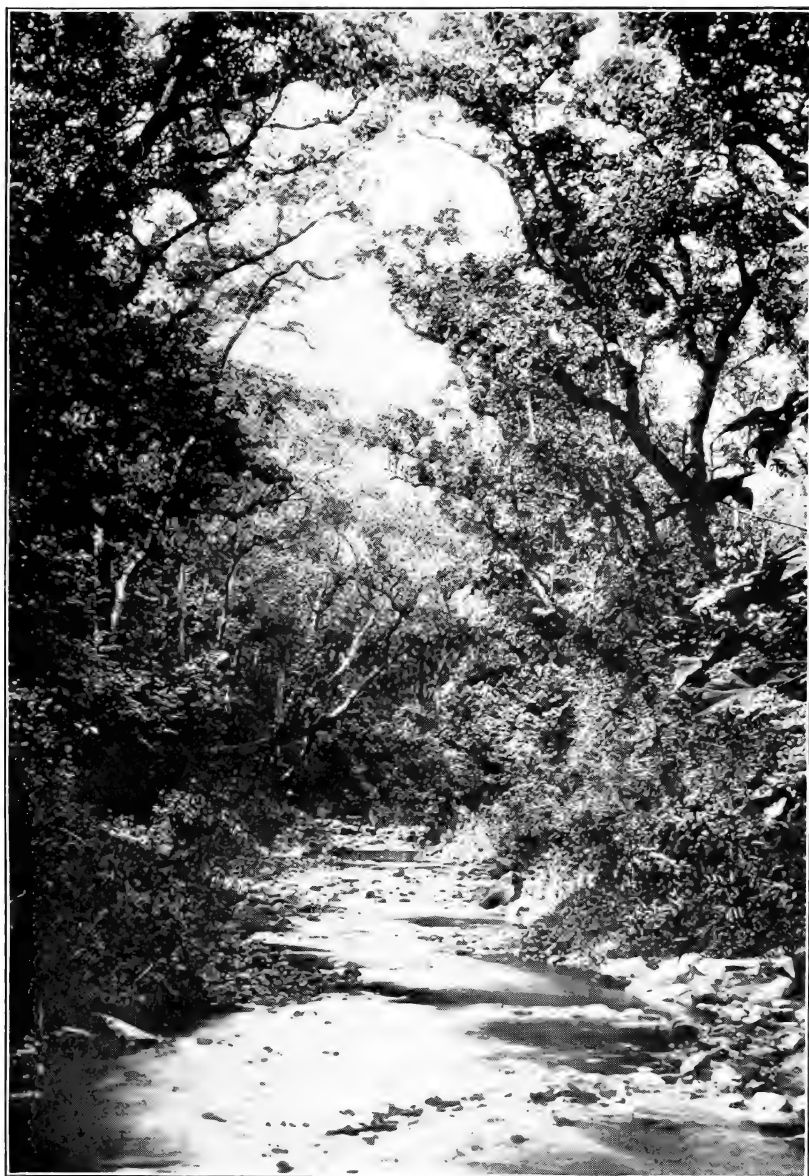


Plate III.

Along the Stream

A glimpse along the stream which flows through the avocado groves of the Canyada at Queretaro. The trees on both sides are avocados.

cado culture. One evidence of this interest is the study now being carried on by the University of California, of which this paper is a preliminary report. The purpose of these investigations, as outlined by Dr. H. J. Weber, is to bring to light as many interesting facts as possible concerning the history and distribution of the avocado in Mexico; the botanical and horticultural classification of the various species and races involved; the conditions of climate and soil under which these species and races are found; methods of tillage, irrigation, pruning, and so forth, which are employed in connection with their culture; their bearing habits and the character of the fruit under different environmental conditions; and the principal insect and fungus enemies which attack them.

To investigate thoroughly the subject in all sections of the republic in which avocados are grown would necessitate an immense amount of work. When it is remembered that Guatemala is a country whose total area is less than that of any one of half a dozen Mexican states, and that it required sixteen months to complete the study of Guatemalan avocados undertaken in 1916 and to introduce successfully into the United States the varieties selected for trial, it is obvious that the completion of a similar investigation of Mexican avocados would require several years' time. The present investigations have not been planned to extend over such a period, hence it will not be possible to go into such detail in regard to certain features of the work as it was in Guatemala.

This paper is a report upon the first six months' work. It has not yet been possible to visit Atlixco and certain other important avocado regions, and fruits of the Guatemalan race have not been in season since my arrival in the country; hence it is felt that this must be termed a *preliminary* report, since it cannot cover in a complete or final manner any of the important features of Mexican avocado culture. In preparing it, I have limited myself to an attempt to present certain observations which I believe should be of interest to Californians, and to give an idea of some of the results it is hoped will be achieved before the work is finished.

HISTORY

We have always considered that the avocado played an important part in the life of the ancient Mexicans. It would be interesting, however, if we could obtain a more definite idea of the extent to which it was used by them as food, and their attitude toward it. Did they esteem it highly, and did it play any part in their intellectual life? The mango, we know, is of such great importance among the inhabitants of Hindustan that it has come to be used in religious ceremonies and to appear in their legends and folklore.

Two means of investigating this subject suggest themselves to me. One is to study the accounts written after the Conquest, and the other is to observe the extent to which the avocado is used and esteemed by the Indians of the present day. The latter method, while it may at first glance seem to be of no value, appears to me very promising. We know that many of the customs of the ancient Mexicans have persisted down to the present time. There are regions, in fact, where four hundred years of contact with European civilization seems scarcely to have made any impression upon the habits of the people. I had particular occasion to observe

this during my stay in northern Guatemala, as it is especially true of the Maya race which occupies northern Guatemala and southern Mexico. The staple foodstuffs of the people are largely the same as at the time of the Conquest. Indian corn, black beans, squashes and a few other vegetables are still the principal articles of diet. The most important change which the Conquest seems to have brought is the introduction of cane sugar and coffee, two plant products not known in the New World in earlier times.

Will it not be true, therefore, that the position held by the avocado at the present day among the tribes of Mexico, especially among those which have not come in such close contact with European civilization as have the Aztecs of the Mexican plateau, is very much the same which it occupied four hundred years ago? I believe we are safe in considering that it is. After all, four hundred years is a short time in which to change entirely the habits of a people. Particularly does this hold true in regard to habits of eating.

We must depend upon the accounts of the early Spanish voyagers, and the writings of recent students of archaeology, to give us the traditions concerning the avocado. I have already found one instance in which the name of this fruit enters into Aztec mythology. According to Robelo, the mythical Yaotl was appointed by the gods to be guardian of the penitent Yappan; he treated Yappan and his wife with such excessive cruelty that he was transformed into the insect Ahuacachapulín. The latter name is composed of two words, *ahuacatl* and *chapulín*, or "avocado-grasshopper."

The method of designating the avocado in the picture writing of the Aztecs is known, and has been published in the United States. The Aztec name for this fruit, *ahuacatl*, from which we derive our name avocado, has been the subject of recent researches in the literature, but I will not here enter into detail regarding the origin and significance of the word.

Practically our only knowledge of the avocado among the ancient Mexicans is based upon its uses among a single tribe, the Nahuatl or Aztecs, who occupied the Valley of Mexico at the time of the Conquest and were the most powerful of Mexican nations. Compared to the study given this tribe,—its language, religion, daily life, and so on,—by archaeologists and historians, the amount given to the other peoples of Mexico, with very few exceptions, has been inconsiderable. As the result of this, our knowledge of the avocado among the ancient Mexicans is mainly a knowledge of it among a single people of Mexico, the Aztecs. In order to broaden the range of our knowledge we must have as much information as it is possible to obtain regarding the extent to which this fruit was grown by other tribes, their names for it, and the uses to which it was put by them.

The accounts of the early Spanish travelers are interesting, and by studying them carefully and correlating the statements of these early students with our present knowledge of the avocado I believe we can extract more of value from them than has yet been obtained. Particularly is this true in regard to the distribution of the various races of the avocado at the time of the Conquest; by a careful examination of the different accounts it is possible to tell in most instances precisely what race is being described, and this, together with the mention of a geographical location which usually accompanies each account, will throw much light upon our study of the races and their distribution. It is to be regretted, however, that nearly all of the early travelers had a better eye for medicines than foods, and they

devote too much of their attention to the medicinal virtues of the avocado. From our point of view it would have been much better if they had given us more information concerning its culture among the ancient Mexicans.

If we are safe in assuming that the avocado is of more or less the same importance as a foodstuff among the Mexicans of today that it was in pre-Columbian times,—and I believe in general this must be true,—then it can be said that this fruit did not play such an important role in the daily life of the Mexicans as it did among the Maya tribes of Guatemala. For I have seen no place in Mexico, as yet, where the avocado is so extensively used,—where it is such a veritable staple,—as it is in northern Guatemala. Nor does its use among Mexicans of European blood seem to be so extensive as among Guatemalans of European blood. Recently, while working in the highlands during the height of the season for avocados of the Mexican race, I was somewhat surprised to observe that not even in Queretaro, an important center of avocado culture, were there quantities of fruit in the market at all comparable to the huge piles seen in the markets of Guatemala City almost any day in the year. I am certain that for every bushel of fruits I saw in the markets of Queretaro, I could, on the same day, have found three in the markets of Guatemala City.

CLASSIFICATION

To those interested only in the practical side of avocado culture, the subject of classification may not possess a great deal of interest. Yet a moment's reflection is sufficient to convince nearly anyone of the immense practical importance of this subject, and the immediate necessity of its thorough study.

Horticultural science is founded upon botanical science, in certain very important particulars at least, and botanical science is founded upon classification. Without an adequate knowledge of the classification of avocados, the horticulturist begins his work of planting, cultivation, and those numerous other operations which have for their object the production of fruit, under a tremendous handicap. Let me illustrate. A certain horticulturist in California has learned, by empirical means, that avocados from Florida do not succeed in California. This is because they are of the West Indian race, but we are assuming that he knows nothing about races; to him an avocado is an avocado, and all he knows is that avocados from Florida have frosted down every time he has planted them in his orchard. A friend of his at Miami sends him a young tree with the request that he plant it. It happens to be an avocado of the Guatemalan race, which would succeed in California; but knowing nothing of races and remembering his previous experience with avocados from Florida, he throws it on the trash heap.

Another hypothetical instance to show the opposite state of affairs. An avocado is introduced into the United States from the lowlands of southern Mexico, and a tree is sent to a man in California by the Department of Agriculture at Washington. This man knows that the avocados of the region whence this comes are mainly of the West Indian race, and he knows that the West Indian race has been tested pretty thoroughly in California and does not give satisfactory results. He is undecided for a moment; shall he plant it and see if by careful protection during the first

few winters he can pull it through? It occurs to him to crush a leaf, and immediately he detects a familiar aromatic odor. It is of the Mexican race! Naturally he will plant it, for its chances of success are excellent.

The classification which we have been using in the United States for the last few years seems in general to be quite satisfactory. It covers the majority of the varieties now in cultivation. It does not, however, seem to cover every one of them, and we have not yet carried it to a point where we feel absolutely certain in every case that we have made a correct diagnosis. We must continue to study the matter until we have gone to the bottom of it. This involves an investigation of the avocados of all tropical America, a work which will require some years, but it is to be hoped that it may be carried to a conclusion. It will be a decided advantage if this important subject can be studied thoroughly while the avocado industry is yet in its infancy.

Mexico probably offers more material for this study than any other country. It is a vastly better field than Guatemala, because of its larger area and the abundance of all the known races. In Guatemala trees of the West Indian and Mexican races are comparatively scarce, the Mexican especially.

This subject must be studied first from a botanical standpoint, later from the horticultural point of view. We must first know with what species we are dealing, before we will be able to classify our horticultural races. The differences between a botanical species and a horticultural race or group are technical in character, and I will not here discuss them in detail; suffice it to say that the botanical species is the broader division, the horticultural races occurring within the species. The question which is now confronting students of avocado culture is this: Are the varieties with which we are dealing nothing more than horticultural forms of a single botanical species, or are there several different species involved? In the past, we have generally considered that all of the cultivated avocados belonged to the species *Persea americana* of Miller, formerly known as *Persea gratissima* of Gaertner; but it seems highly probable that we have held to this belief simply because the avocados have never been studied sufficiently to bring to light the specific differences which separate some of the groups we have termed horticultural races. Botanists who have worked on this genus have usually been able to examine nothing more than a very limited number of herbarium specimens, in the majority of cases without fruits, and the classification which has resulted has been somewhat unsatisfactory from the horticultural viewpoint.

I wish to mention briefly the most important species or races which are being studied here in Mexico, in order to give an idea of the present state of the investigations.

West Indian race. This seems to be the true *Persea americana*. In order to determine this beyond the possibility of a doubt it will be necessary to look up the original description of the species, study it carefully, and ascertain from what regions the specimens were obtained upon which the species was based. But as far as can be judged at present, the name *Persea americana* was originally given to the kind of avocado which we term the West Indian race.

Several botanical varieties of this race have been created by botanists. Of those which Meissner described in De Candolle's *Prodromus* the

varieties *vulgaris*, *oblonga*, and *macrophylla* have every appearance, so far as can be judged from the descriptions and the source of the specimens, of being nothing more than horticultural forms. Meissner did not see the fruits of any of them. Retaining them as botanical varieties, if they are in reality no more different from the type than hundreds of other cultivated forms (and I judge from the descriptions that this is the case), is setting a bad precedent and perpetuating the present confusion. Following this example, an almost innumerable series of botanical varieties could be created. In reality they would be nothing more than horticultural forms.

So far as known to me, this race or species has not yet been found in an indigenous state. Some of the forms observed here in Mexico are very primitive in character, but none have been found in the wild.

Guatemalan race. This has probably received less attention from botanists than any of the others. I cannot find, in fact, any references to specimens from the Guatemalan highlands among the descriptions of *Persea americana*. The differences between this race and the West Indian, judged by the trees in cultivation, seem scarcely great enough to make them different species; it is possible that the wild forms of both will yet be found, in which case a more satisfactory determination can be made. As yet the Guatemalan race has not been found in a condition known certainly to be indigenous. It is of the greatest importance that the wild prototypes of all the races be found, if they still exist, as only in this way will it be possible to determine their botanical standing in a thoroughly satisfactory manner.

Mexican race. This avocado occurs abundantly in an indigenous state about the base of the volcano Orizaba, at elevation of 5000 to 6000 feet. Its range in elevation and its geographical distribution have not yet been fully worked out, but enough has been observed to make it certain that the species is truly indigenous in Mexico.

The wild trees of this species produce fruits usually of obovoid form, almost never larger than hen's eggs. It does not seem possible to believe that the thick skinned varieties of the West Indian race have been derived from this species by cultivation. The two should probably be considered distinct species, as was done by the botanists Chamisso and Schlechtendahl when they gave this species, in 1831, the name *Persea drimifolia*. Meissner, in De Candolle's *Prodromus*, retains this as a good species, and the *Biologia Centrali-Americana* does the same, but the botanist Mez, in 1889, reduced it to the standing of a botanical variety of *P. americana*. It appears that we have never gone into the matter thoroughly enough in California to ascertain the standing of this race, and have considered it nothing but a cultivated form,—not even a botanical variety,—of *P. americana*. I believe when the investigations now under way are concluded we will be justified in considering this to be a distinct species, *P. drimifolia*, as established in 1831.

The Chinini. We have not had to consider this fruit in making our classification for California use, but its importance in Mexico and Guatemala necessitates its inclusion in any general scheme of classification.

This is the fruit which I introduced from Guatemala last year under the name *coyo* or *shucte*. In southern Mexico it is known as chinini. I have seen it throughout the southern half of Veracruz state, and am told that it is abundant in Tabasco. It will not be described here, but it may

be said that a preliminary study of the literature seems to indicate that we are dealing with the *Persea schiedeana* of Nees, reduced by Meissner in 1864 to the rank of a botanical variety of *P. americana*. It seems that very few botanists have collected this species, and that it is imperfectly known botanically, the fruit having been seen by none of the botanists who have attempted to classify the plant. Since ample botanical material is now available its correct classification should be a simple matter, and I am convinced from my observations of the tree and its habits that it is a distinct species, not to be included as a variety of *P. americana*.

The classification of the Fuerte and Puebla varieties is still in doubt, as I have not yet been able to visit Atlixco to see the parent trees and determine whether they represent a distinct race common in that region, or whether they are aberrant forms probably due to crossing. It is to be hoped that this matter can be settled before the termination of the investigations in Mexico. In the meantime, I do not believe these varieties should be included in the Guatemalan race, as they evidently are not true Guatemalans. This is indicated by the presence of the aromatic odor in the leaves, a character which the Guatemalan race does not possess.

In the past, numerous efforts looking toward a classification of cultivated avocados have proved unfruitful because the question was not attacked from a sufficiently broad standpoint. The result has been a classificatory system which included nothing more than a limited number of varieties belonging to one or more races. In glancing over one or two of these attempts, one comes upon such terms as "round pagua," "large pagua," "San Angel black," "Chalco green," and so on; these cannot be considered natural classes or groups in any sense of the word. The terms "round pagua" and "large pagua" would include in the one case all round fruits of the West Indian and Guatemalan races, in the other all large fruits of both these races, whether round or not. "San Angel black" and "Chalco green" would include all black fruits from San Angel and all green ones from Chalco. It happens that all of these belong to the Mexican race, but under these two groups we would get a motley collection of forms and sizes. The defect of the system is that it has no regard for the race to which the fruits belong, but classifies them upon the basis of form or color, a purely artificial arrangement and one that is only satisfactory where a natural classification,—one based upon relationship and not upon arbitrarily chosen characteristics,—is utterly impossible.

If a classification upon an arbitrary basis is undertaken, using form, color, and size of the fruit as classificatory characters, it must not be made to extend beyond the limits of a race. Some such classification may be desirable, later on, to bring together all varieties of similar characteristics within each race. Thus all varieties of the Mexican race can be classified upon the basis of form, size, season of ripening, or some other important characteristic.

DISTRIBUTION OF THE RACES

This subject can only be touched upon at the present time, since many sections of Mexico have not yet been visited. It is possible, however, to give an idea of the distribution of the various races and to mention the regions which have the reputation of producing the finest fruits of each.

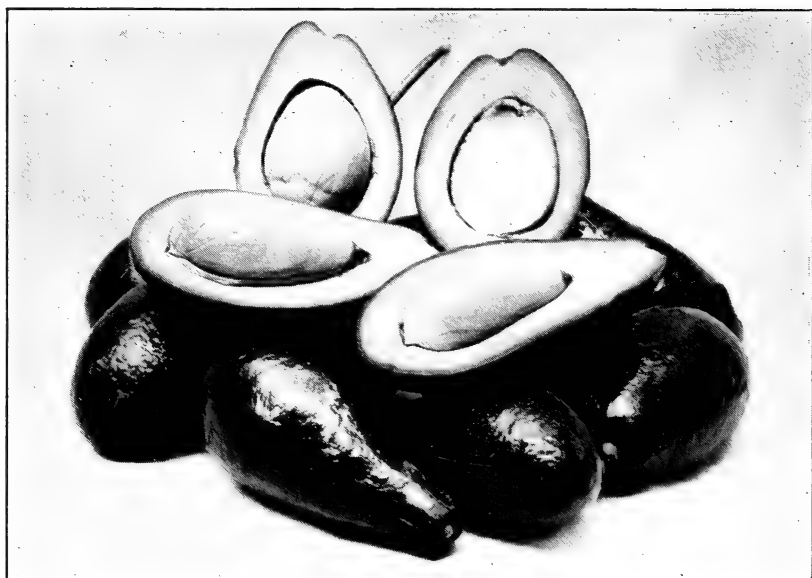


Plate IV.

Typical Fruits of the Mexican Race

The proportionally large seed is one of the greatest defects of this race.



Plate V.

A Market Scene in Puerto, Mexico

The avocados in the foreground are of the West Indian Race.

The West Indian race is predominantly a lowland avocado, as is well known to North Americans. I have observed it on the Gulf coast at Tampico, which I suspect may be the northern limit of its cultivation. Southward from Tampico it is common all along the coast; in the state of Veracruz it is abundant, as also in Tabasco, Campeche, and Yucatan. Both Tabasco and Yucatan have the reputation of producing very fine fruits of this race.

The West coast I have scarcely been able to touch as yet, but I believe this race is found along most of its extension from Mazatalan, or perhaps farther north, to the Guatemalan border. In the vicinity of Tapachula, Chiapas, only a few miles from the Guatemalan frontier, I have found some excellent fruits, equal to the best produced in Cuba.

This race extends across the Isthmus of Tehuantepec, there being no high elevations in this region. I do not believe it is found on the plateau of central Mexico, but I have not yet visited many parts of this region. At Orizaba, in Veracruz state, it is cultivated in great abundance, and it is worth noting that this city lies at an elevation of 4200 feet, which is about 1500 feet higher than I found the West Indian race to be grown anywhere in Guatemala.

The Mexican race is the predominant race on the plateau. From San Luis Potosi on the north to Puebla on the south it seems to be abundant, and beyond these limits it is grown to a certain extent.

Its culture is not limited to the highlands, but is most extensive there; I have seen a few trees in the state of Veracruz at sea level. As a wild tree it seems to occur abundantly in this state, notably about the base of the volcano Orizaba, and probably farther to the north. It is grown in the state of Oaxaca and also, I am told, in Guerrero, and I believe it to occur as far north as Nuevo Leon, though not in great numbers. Queretaro is probably the best known center of production.

The Guatemalan race I have scarcely seen in Mexico up to the present. We know it to be grown in the state of Puebla, and from descriptions of avocados grown in Jalisco and Nayarit which have been given me by Mexican horticulturists I take it that this must be the race found in the region north of Guadalajara, but this remains to be investigated. This race extends across the borders of Guatemala into the highlands of Chiapas, but I have not found it on the coast of that state.

CLIMATE AND SOIL

As in other tropical countries, climate in Mexico is largely a matter of altitude. It is the custom to speak of the three zones which I have treated in my paper on the avocados of Guatemala, published in the 1917 Report of the California Avocado Association. These zones are usually referred to as the *tierra caliente*, *tierra templada*, and *tierra fria*, or hot region, temperate region, and cold region, but as suggested in the paper mentioned the names tropical, subtropical, and temperate seem less misleading. The tropical zone extends from sea level to 2500 or 3000 feet; the subtropical from about 3000 to 7000 or 7500; and the temperate from 7500 to the upper limit of cultivation. The fruit trees mentioned in the discussion of these zones in Guatemala are in most cases characteristic of the zones in Mexico as well.

A lengthy consideration of the climatic conditions in different parts of Mexico is not within the scope of this report. It will suffice to mention a few important characteristics of some of the principal avocado regions.

The West Indian race seems to find optimum conditions of growth and fruit production in regions where high temperatures are combined with reasonably heavy precipitation. The regions of very heavy rainfall do not seem to produce as good fruits as those where there is a dry season of considerable length and where the amount of precipitation during the year is not over 75 or 80 inches.

The Mexican race, on the other hand, does not seem to be as successful on the coast as at considerable elevations. This is probably due to the fact that its native home is in the mountains at elevations of 4000 to 6000 feet. It has seemed to me that it finds optimum conditions for growth and fruit production at elevations of 5000 to 6000 feet, and in regions where the climate is comparatively dry. I believe this race is naturally adapted to withstand a dryer atmosphere than the West Indian.

Taking the climate of Queretaro, for example, as representative of the optimum for this race, we find it to resemble rather strikingly that of southern California. The rainfall is perhaps slightly greater (I have not yet been able to obtain meteorological data), and occurs at a different season of the year, but the temperatures seem to be very much the same, and the relative humidity is low, though perhaps not so low as in California. With such a climate, good soil, and the proper irrigation, the conditions seem to be almost ideal for this race.

The soil in the avocado groves of Queretaro is a clay loam, in places heavy enough to be termed clay. I am coming more and more to believe, as I examine the soils of the different avocado regions of tropical America, that the avocado greatly prefers a heavy soil to a light one. In these countries it is very common to find trees growing and fruiting well on heavy clay; the best results which I have seen were obtained on clay loam. Very light soils are rare; I have seen nothing in Mexico so porous as the volcanic soil of Antigua, Guatemala. But volcanic soils, even though light and friable, are usually rich in plant food, I believe. From what I have seen, I would conclude that the avocado prefers a good strong soil; a soil well drained, but rather heavy, and not sandy or exceedingly friable. We know from experience, of course, that the avocado will succeed on a wide range of soils, but it is still something of a question which type may be considered ideal. If I were going to plant an orchard, I would look for a small valley where an alluvial soil had been formed of material washed down from mountains or hillsides where clay predominated. I am speaking now of Mexico; it might be dangerous to plant in a valley in California because of the exposure to frosts.

So far as I have been able to observe up to the present all races of the avocado have this same preference for a heavy soil. I have not been able as yet to distinguish any differences in this respect. At Orizaba the West Indian, the Mexican, and the Chinini are all three grown in great abundance, often side by side. The land is sloping, hence well drained, and the soil varies from a heavy loam to clay. It seems to give excellent results.

I believe it will be well for Californians to keep in mind this preference when selecting land for an avocado orchard.

CULTURAL PRACTICES OF THE MEXICANS

There are certain regions in Mexico where avocados are grown in more or less regular plantations with the definite object of commercial fruit production. Queretaro is one of the most important of these. Here there is a small valley called the *Canyada*, some two and a half miles in length by a quarter of a mile in width, which presents, when viewed from the neighboring hillside, the appearance of a solid grove of avocado trees. Such a region as this gives us our best chance to observe the cultural practices of the Mexicans.

It is of interest to note that the Mexicans understand the principle of seed selection, and that intelligent orchardists are careful to choose seeds from the very best fruits when establishing a new plantation. Needless to say, all of the avocado plantations in Mexico are composed of seedlings; budding and grafting have been attempted only recently, and on a very limited scale. While I do not know that this principle of selection is applied generally, it is understood by the better class of natives, at least. It must be remembered that a large proportion of the trees in Mexico were never intentionally planted, but have sprung up from dropped seeds, in which case there is no opportunity for the application of this principle.

One of the most striking features of the groves at Queretaro is the immense variation in the size of the trees. Upon an acre of ground will be found trees of all sizes, varying from slender saplings struggling upward toward the light to rugged old giants sixty feet in height, with trunks four feet in thickness. The trees are nearly always too close together. Being seedlings, and planted on good soil, they would develop to enormous size if given the opportunity, but when they are often less than ten feet apart their development is necessarily limited. It is evident that under the conditions which obtain at Queretaro,—I am referring now to climate and soil,—the trees should not be planted less than 50 feet apart; this applies as well to many other sections of Mexico. Since we do not yet know what size budded trees will ultimately develop in California it is impossible to say whether the same rule should apply to our budded groves or not. I am inclined to suspect that our trees will ultimately reach large size and that it will be necessary to thin out most of the orchards.

When the groves are old and dense nothing is usually planted beneath the trees. The ground is never tilled. The deep shade prevents anything but a scanty growth of weeds and grass in most places. In those instances where the groves are less dense,—where there is open space between the trees,—such crops as barley and alfalfa are sometimes planted beneath the avocados.

I was deeply impressed by the appearance of a young grove which I encountered in the middle of the *Canyada*, after having rambled about for a couple of hours in the deep shade of the older plantations. None of the latter which I had so far seen were planted in regular order; the trees were scattered about promiscuously, rarely more than ten feet apart, and sometimes a group of three or four within a circle six feet in diameter. Suddenly I came upon a young orchard, perhaps five years old, in which the trees were planted in straight rows about 20 feet apart, with the ground between producing a splendid crop of alfalfa. Here at last, I thought, was something approaching the California method, and I would have an opportunity to compare the results obtained by the no-tillage, no-

irrigation method and those obtained by a more modern system. I walked into this young grove, knee deep in alfalfa, and began to examine the fruits. Immediately I was struck by their superior size and the uniformly heavy crop over the entire grove. I hunted up the caretaker and talked to him. He told me that they irrigated every three weeks; a good stream ran by the edge of the grove, and water was always available.

The impression which this grove made upon me has not yet commenced to fade from my memory. The system of cultivation was certainly the best I have seen in Mexico, judging by the results. Unfortunately, I have seen no groves here which are clean cultivated, or irrigated and tilled, as in California. I cannot, therefore, compare the effect of this system of combining avocados and alfalfa with clean cultivation, but when compared to the method usually followed in Mexico the results strike one as nothing less than marvelous. The alfalfa was planted close up around the trees; combined with the foliage of the latter the ground was effectively shaded. The trees were all branched low, and were fruiting right down to the ground.

As to the question of mulching versus tillage, I have as yet had no opportunity to make any comparisons, as tillage is rarely practiced in Mexican avocado orchards and the only mulching done is that accomplished by Nature. I do not believe the litter which results from fallen leaves and the accumulation of weeds is sufficient to mulch the trees effectively, but this is all they ever get.

Many of the old groves are so crowded that it is not possible for the trees to perform creditably. This crowding forces the crown to form high above the ground, unquestionably a bad feature. Rarely are any branches given off lower than eight to ten feet from the ground. In groves where there is not so much crowding the crown is formed lower and is of better shape.

No pruning seems to be done, nor are the trees encouraged to develop in any particular form. It seems to be left to Nature to take care of such matters, and where she has the slightest opportunity she usually succeeds in getting pretty good results. The great obstacle which prevents most of the trees from developing broad, well branched tops is the crowding to which they are subjected.

The interesting custom of tree renewal, practiced with various fruit trees in the American tropics, can often be observed in the avocado groves of Mexico. I have noticed it particularly at Orizaba and Queretaro. When the trees become old and decadent, sprouts develop around the base of the trunk. Several of these are allowed to grow, so that when the old trunk has finally to be cut away one or more vigorous young sprouts are ready to take its place. Sometimes these sprouts grow to considerable size before the original trunk is destroyed. Often as many as three or four of them are allowed to develop. It would seem better if only one were permitted to each tree, to replace the original. I have not yet been able to learn that anything is done to produce these sprouts; they seem to appear naturally and are simply allowed to remain.

Avocado culture is too young in California for this method of tree renewal to be of much value to us, but the day will come when it can be tried out with profit. Apparently the new tree which develops has a considerable life, and is as productive as the original.



Plate VI.

One of the Patriarchs

Trunk of an old avocado tree in the Canyada at Queretaro, showing approximately the maximum development attained by the Mexican race.



Plate VII.

Tree Renewal

When the old tree has to be cut down the three sprouts which arise from the base of the trunk will remain and form a new top. This is a common method of renewal.



FRUITING HABITS AND PRODUCTIVENESS

A comparison of the fruiting habits and productiveness of the different races brings out some interesting points of difference, some of which are of considerable importance from the standpoint of the avocado grower.

In productiveness, it seems to me that the races rank in approximately the following order: Mexican, Guatemalan, West Indian, and Chinini. In other words, the Mexican is the most productive of all races, the Guatemalan coming next, followed by the West Indian, and lastly the Chinini, which falls much below the others in this respect. The Mexican I would place at the top of the list because of its ability to produce heavy crops, combined with its regularity in fruiting. The Guatemalan in many instances produces as heavy crops as the Mexican, but as a race it shows a decided tendency toward irregularity in fruiting, there being many more "off" years than in the Mexican. The West Indian in some instances produces heavy crops,—the Trapp of Florida is a notable example,—but as a race it is decidedly less productive than the Guatemalan. The Chinini is markedly unproductive; occasionally a tree will be found which bears heavily, but it is safe to say that 90% of the seedlings growing in southern Mexico and Guatemala are shy bearers.

It is worthy of note that old trees of all these races, here in the Tropics, seem to be as productive as younger ones. I have seen huge trees of the Mexican race, which must have been nearly a hundred years old, bearing excellent crops. It seems to me we are justified in expecting the avocados we are planting in California to remain in profitable production much longer than citrus trees ordinarily do. At the same time, it is probable that trees grown under the constant stimulus of intensive cultivation and fertilization will exhaust themselves more rapidly than those grown under the more normal condition which obtain here in the Tropics. I use the word normal in the sense that the conditions found here more nearly approximate those under which the avocado has been accustomed to exist in the wild state. These conditions, it seems to me, should tend to prolong the life of the tree because there is no stimulus to excessive fruit production. When we plant avocados in California our object is to get as much fruit as possible out of them every year; the number of years which the tree may stand up under such treatment is a matter of secondary importance.

My studies in the Canyada at Queretaro left me impressed with the uniform manner in which seedlings of the Mexican race perform. In the lower part of this valley practically every tree was fruiting well, yet they are all seedlings, hence each one a distinct variety and consequently subject to varietal differences in fruiting habit as well as other characters. I do not believe you can duplicate this in any of the principal avocado regions of Guatemala. It will nearly always be found, when trees of the Guatemalan race are under consideration, that many of them do not bear regularly. They have a pronounced tendency to bear in alternate years. This probably is not true of every variety, but it is true of the race as a whole. I have never examined a group of seedlings in Guatemala and found every one of them in bearing. There are always some that are "descansando"—"resting," as they say in Guatemala; they produced the previous year, and are now taking a year off preparatory to bearing another good crop. As stated in my paper on Guatemalan avocados, we may be able to control this habit to a certain extent by judicious cultural treatment, so that the

trees will tend to bear moderate crops each year instead of an enormous crop one year and nothing the following. There may be varieties, also, which will not exhibit this tendency. But in general it is certainly a pronounced characteristic of the Gutemalan race, and it does not seem to be nearly so noticeable in the Mexican.

The West Indian race, as observed in the Mexican lowlands, is not altogether satisfactory in regard to productiveness. An examination of numerous trees at Orizaba showed about half of them to be fruiting. Whether it is a case of this same tendency to fruit in alternate years I cannot say, as I have not yet had an opportunity to make sufficient observations on the question. I have noticed that large fruited varieties of this race are particularly unproductive. I have not seen a single one, in fact, which seemed to be producing to the maximum of its ability. This is in marked contrast to large fruited varieties of the Guatemalan race. I have seen several of the latter in Guatemala which bore so many fruits that the trees were not able to develop all of them to normal size. Many of them had to drop off before half grown, or if they remained on the tree to maturity they were small and stunted.

The average age at which seedlings come into bearing differs noticeably among the races. We have had ample evidence of this in California, insofar as the Guatemalan and Mexican are concerned. Under favorable cultural conditions, I believe we can consider that the Mexican will commence fruiting the third or fourth year from the seed, and the Guatemalan the fifth to eighth year, usually not earlier than the sixth. The West Indian has not been so carefully observed, but I believe it is rare for it to commence earlier than the sixth year. Here in the Tropics, where the growth of the trees is slower, due to the lack of cultural attention, fruiting probably commences from one to three years later than in California. If good cultivation were given the trees, however, they would probably come into bearing fully as early as in California, if not a year earlier in some cases.

The tendency to produce two crops a year, which has been noted in California in the Northrup variety, seems to be a characteristic of the Mexican race, though not present in all varieties. At Queretaro, in the month of July, I observed a good many trees which were flowering and setting new crops of fruit, although the main crop was just getting ripe and the normal flowering season is not due until next February or March. This secondary crop of fruit appears always to be a small one, by no means equalling the main crop in quantity. I have never observed this habit of fruiting twice a year in any of the other races. It seems to be limited to the Mexican.

THE CROP: SEASON, HARVESTING, AND MARKETING

The season of ripening depends mainly upon two factors, race and elevation. The Mexican race, which is justly entitled to be considered the most important one in Mexico, though it is not so predominant as is the Guatemalan race in Guatemala, commences to ripen on the central plateau in the month of July, and continues until October or November. It remains in season during a much longer period than does the West Indian in the lowlands. Climatic conditions may account for a large part of this difference. The most important months are August and September. In the

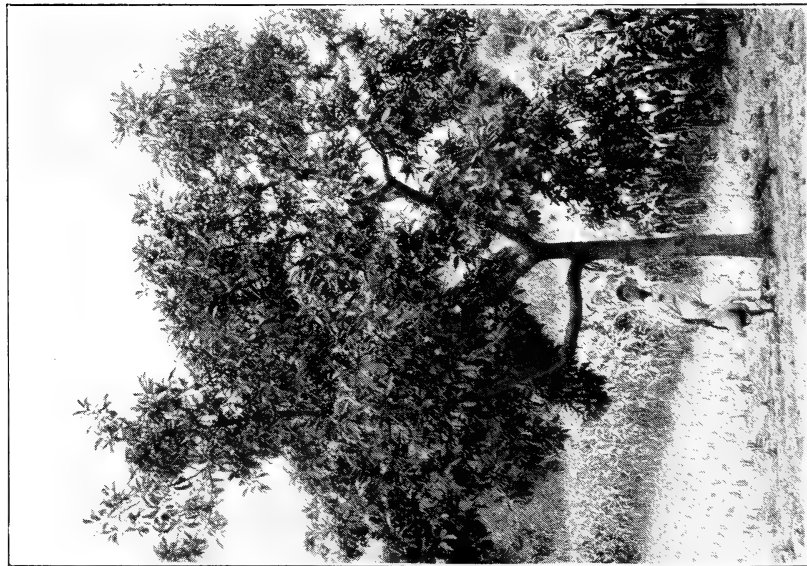


Plate VIII.

A Young Avocado in the Canyada at Queretaro

This is a tree of good form, and shows the cultural conditions under which the avocado is sometimes grown.



Plate IX.

Harvesting the Avocado Crop in the Canyada at Queretaro

The bamboo pole held in the hand is used in pulling the fruits from the trees.

lowlands, where this race is not so common but nevertheless is occasionally seen, the season is somewhat earlier than on the plateau. At Orizaba I found it ripening in May. The elevation here is 4200 feet, but the climate is warmer than is sometimes the case at this elevation, due to the exposure. The season is by no means so long in the lowlands as on the plateau.

The Guatemalan race I have not yet been able to observe, but it is said to ripen at Atlixco from November to March. I suspect that the fruits picked in November are not fully ripe, and that the season is more properly January or February to May. In the Guadalajara region the season for avocados is said to be December to March, and while I have not yet examined fruit from this region I believe the Guatemalan race to be the one grown there.

The West Indian race ripens on the coast from June to August. July is the principal month. A few fruits may hang on until September. At Orizaba, where it is extensively grown, it ripens slightly later than on the coast, due to the elevation.

The pernicious habit of picking avocados before they are fully ripe is as common in Mexico as in Guatemala. I wish to urge upon the members of the California Avocado Association the importance of suppressing this custom in the United States.

The methods employed in harvesting the fruit in Mexico are primitive, so far as I have seen them, and can give us nothing but negative suggestions. A boy is often sent up into the tree, where he picks all the fruits he can reach and drops them to the ground. Those which are far out on the ends of the limbs are reached by means of a long bamboo pole with a hook on the end. After they have fallen to the ground the fruits are gathered up and placed in baskets or sacks, in which they are carried to market.

The method of shipping avocados which is employed in Mexico seems to be an excellent one. Large baskets,—straight sided and open at the top, commonly 12 to 18 inches broad and deep,—are used in place of the wooden boxes or crates to which Californians are accustomed. The fruits are packed rather tightly in straw or excelsior, plenty of packing material being used. When the basket is full, the top is covered with burlap, which is sewed down tightly. Naturally, such a package as this requires more care in handling than a wooden crate, but as this method of shipment is extensively used in Mexico, not only for avocados but for many other products, railway employees seem to understand that a certain amount of care is required. In a warm climate this method of packing is probably better than that used in the United States, as it allows the air to circulate throughout and thus prevents the fruit from heating. It is generally recognized that avocados can be shipped long distances if kept cool, but if allowed to heat they spoil rapidly.

THE FRUIT: ITS CHARACTER AND QUALITY

The West Indian avocados of the Mexican lowlands are as a rule inferior in quality. The majority of them are small fruits, not over six ounces in weight, and they have enormous seeds. There are, however, a few excellent fruits of this race in Mexico. I am told that those of Yucatan and Tabasco are good. I have not been able to verify this, but I have examined the fruits of the Tapachula district, in the extreme southern end of Chiapas, right up against the Guatemalan frontier, and I found them to

be splendid. The largest ones weigh about two pounds; the flesh is clean, deep yellow in color, and of rich flavor. The seed, while rather large, is not more so than in the West Indian varieties of Florida and Cuba. I would say that the avocados of Tapachula are in general fully equal to those of the latter regions, both in size and in quality. I have not found anything so superior, however, as to merit introduction into the United States.

The Mexican race is naturally of more interest to Californians than the West Indian. We have amply demonstrated that it is well adapted to California soil and climate, and it has been our hope that better varieties than those we now possess might be found, in order to make the cultivation of this race more attractive than it is at present. I will reserve my remarks on this subject for a separate paragraph, and here attempt to give an idea of the character of the fruits of this race which I have examined.

Knowing that Queretaro was one of the principal regions for the cultivation of this race, if not the most important of all, I visited it with the object of examining the fruits to see if any could be found superior to those we already have in California. The result was rather disappointing, for I found in general the fruits are too small to make them of interest to us, and good varieties are exceedingly scarce among them. To give you an idea of their character let me compare them to some of the varieties in California. The Northrup and the Ganter are both considerably larger than the majority of them; in fact I found only a few varieties which come up to the Northrup and Ganter in size. Most of them are not over three inches long, and practically all have very large seeds. It is this characteristic, in fact, which is the greatest defect of the Mexican race, from my point of view. A fruit of six or eight ounces, if it had a very small seed, would be quite acceptable, but most of the Mexican varieties of this weight have objectionably large seeds. The quality of practically all the fruits I examined was good. Very few of them contained any fiber, and they were all rich in flavor. I cannot help thinking that their small size was in a certain measure due to lack of cultural attention, and that if the entire Canyada of Queretaro could receive good cultivation for about two years every avocado in it would just about double in size.

There are a great many seedling trees of this race in southern California which produce small fruits, about the size of hen's eggs, black or green in color, usually obovoid or pyriform in shape. All of you are familiar with some of these seedlings; they are used principally by the nurserymen as a source of seed. Most of the avocados of Queretaro are precisely of this character; but they are held in much greater esteem by the Mexicans than they are by the Californians. They are here considered to be quite satisfactory.

All of the chininis which I have seen in Mexico have been of very inferior quality. The only ones I have ever found to be worthy of propagation were two or three in northern Guatemala. The common chinini of southern Mexico is a fruit about five inches long, slender, often with a well defined neck. It has a thick skin and contains a very large seed; between skin and seed is a layer of pale brown flesh through which run numerous tough fibers. The flavor is rich and oily, resembling that of the ripe cocconut. A poor variety of the chinini is not a fruit which would appeal to a North American, but a good one is a worthy rival of the avocado.

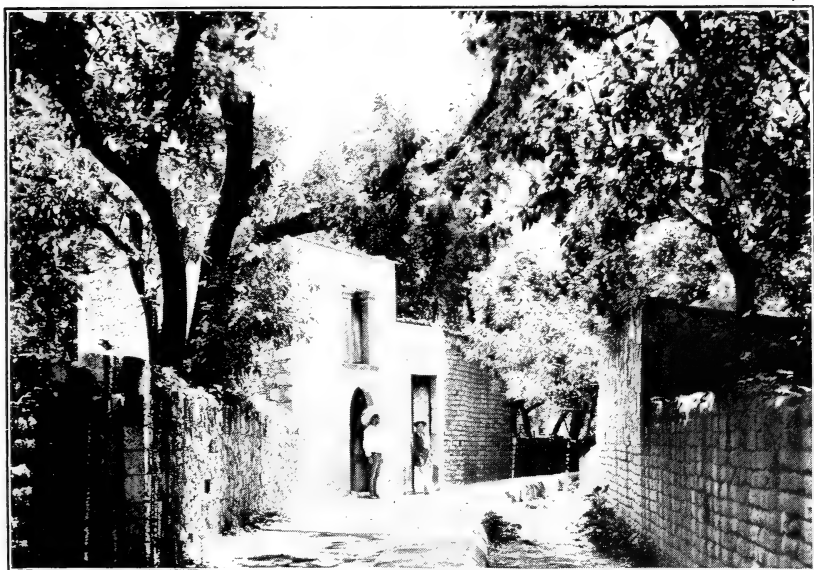


Plate X.
An Avocado Grower's Home in the Canyada at Queretaro
 All the trees are avocado trees.

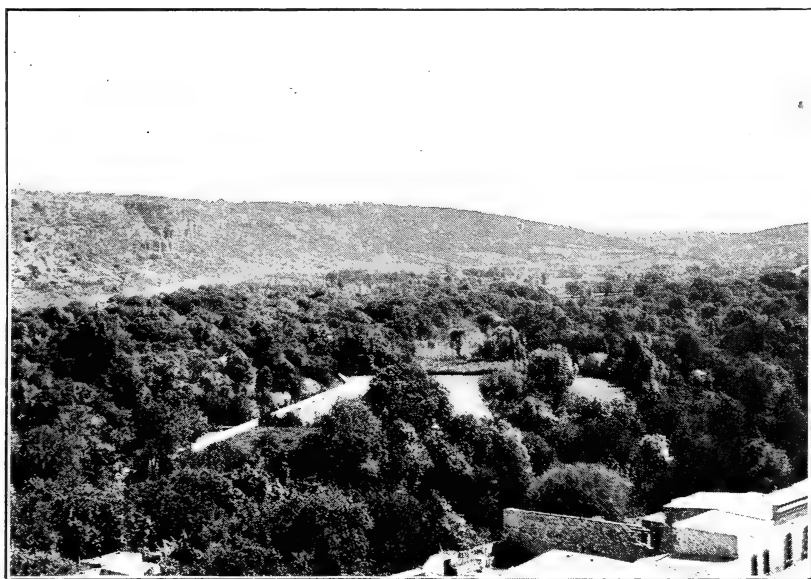
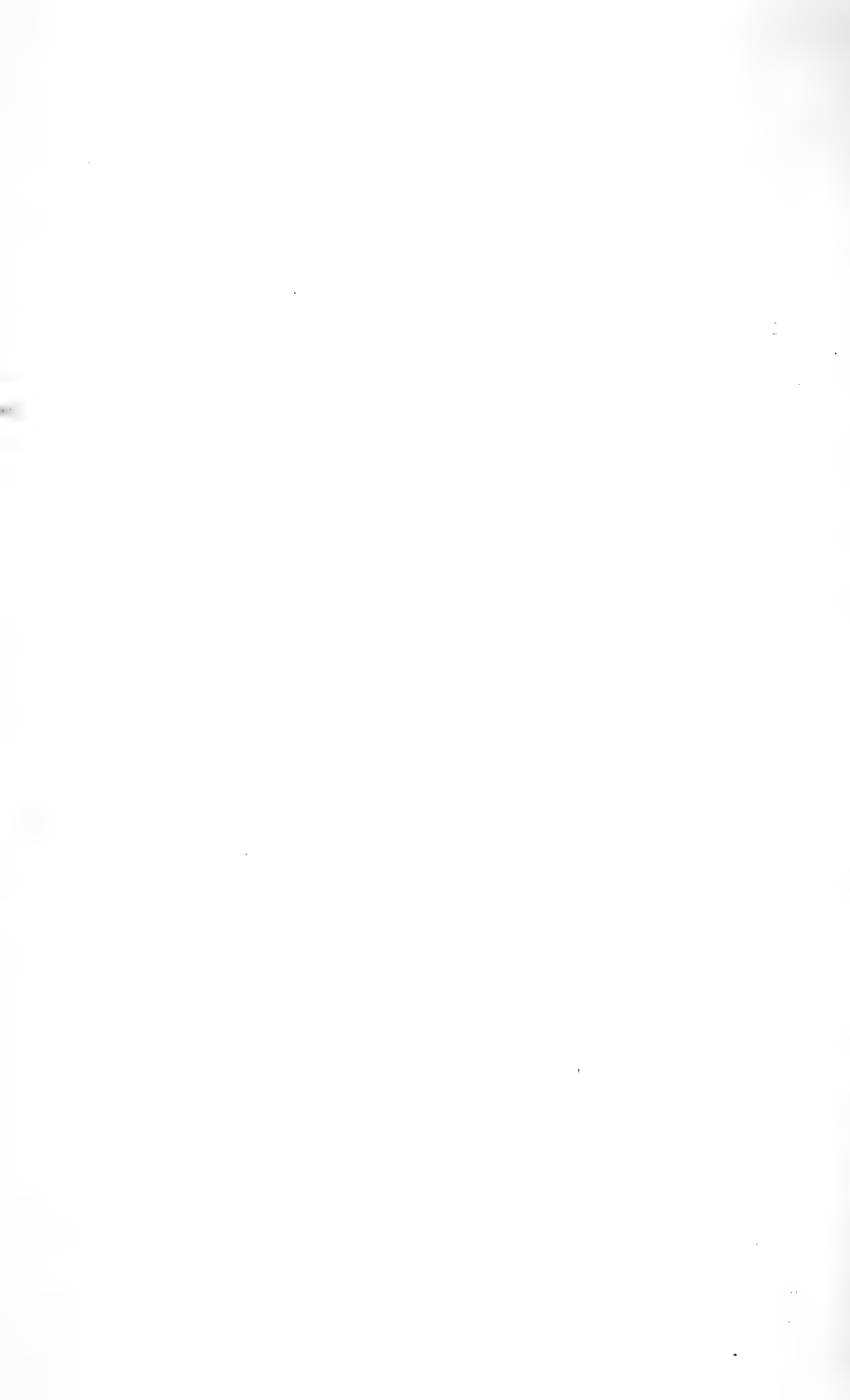


Plate XI.
The Canyada at Queretaro.
 View in the upper end of this famous valley. Practically all of the trees
 in the foreground are avocados.



THE MEXICAN RACE: ITS POSSIBILITIES

In drawing this paper to a close I wish to present for your consideration a few remarks on the Mexican race and its commercial possibilities in California. I do this with a certain hesitation and a profound feeling of distrust, for I have been present at some of the meetings of this association when the Mexican race was discussed. I have seen Mr. Thacher of Nordhoff, back to the wall, defend this race when every one else maligned it, and in all justice I must admit that I myself have previously been on the side of those that maligned.

Since coming to Mexico I am changing my views regarding this race, and while it is somewhat premature to express any decided opinions, I wish to point out what I consider to be some of the reasons why this race must continue to have a place in California orchards, and a rather prominent one at that. Not that I believe it will ever outrank the Guatemalan in importance, or even approach it. I am still convinced that the Guatemalan is the avocado *par excellence*, the *facile princeps* of its kind. But we should not let our prejudice in favor of the Guatemalan make us blind to the virtues of the Mexican.

We must remember that the ripening season of the Mexican race makes it of value. Although Sharpless and other Guatemalan varieties may come into market at the same season, we still look upon the Mexican race as our principal source of supply during the months from October to January. Even granting that the Guatemalan race will eventually cover this period completely, and there will be no need for the Mexican on this account, I still believe there are reasons for growing it.

I will qualify this last statement; there are reasons for growing it, *when we have obtained varieties which more closely approach the ideal*. I do not believe any of those grown in California today will be listed among the commercial varieties twenty-five years hence; but I do believe that it is going to be possible to find others which will have fewer defects than those which we cultivate at present, and which we will be able to cultivate profitably on a commercial scale.

I base this belief mainly upon a fruit I have seen here in Mexico. I purchased it in the market of Orizaba, but it was said to have been grown at Atlixco,—that Mecca of avocado growers which I have not yet been able to reach. It was round, purplish black, glossy, of attractive appearance, about six ounces in weight with clean, yellow flesh of the richest flavor imaginable and a comparatively small seed tight in the cavity. Such a fruit as this,—it would probably go up to ten or twelve ounces under good cultivation,—would be worth growing.

The outstanding defects of the Mexican race, as I see them, are the small size of the fruit and the large size of the seed. It has in its favor hardness, productiveness, ripening season, and a distinctive flavor which is preferred by some people to that of any other race. I am not sure that there is not an opportunity for it to be used to advantage in the tropics in supplying early markets. I found it in the markets of Veracruz a month before the West Indian race put in an appearance, and it would do the same in Florida.

But we must have better varieties. It is *indispensable*, as the Mexicans say. And they are going to be hard to find. I am already convinced of that. My search in the Canyada of Queretaro failed to bring to light

anything that looked promising, but I cannot say that it was a thorough search. There are many other regions in Mexico where this race is grown, and one of these times we are going to run across a variety which is just the thing we are after.

We must remember that the distinctive flavor of the Mexican avocado places it in a class by itself. For this reason I believe it will always find a certain sale, even though placed on the markets in competition with fruits of the Guatemalan race.

On this question of flavor, however, let there be no misunderstanding. I am still of the opinion, after having eaten excellent fruits of the Mexican race in this country, that the best Guatemalan varieties suit me better than any other with which I am familiar. If I could choose between a twelve ounce Guatemalan fruit of good quality and two six ounce Mexicans, I would take the Guatemalan. I like its flavor just as well as that of the Mexican, and it is more convenient to eat.

After traveling in Mexico a few months I think I begin to realize why Americans who have lived in this country almost invariably swear by the Mexican avocado. They have eaten many of them, and they know they are usually of rich flavor. The only other avocados they have eaten are the West Indians of the seacoast, or mediocre Guatemalans of the highlands. The West Indians are in the majority of cases watery and insipid in comparison with a good Mexican, and none but the best Guatemalans are as rich in flavor. It is a simple matter; the Mexican avocado is the best they have eaten, and quite naturally they are prejudiced in its favor. But if they could have eaten some of the excellent fruits from the Guatemalan highlands which I had the pleasure of examining last year, I do not believe their prejudice would be so strong.

To my mind, the question is one of *flavor* rather than of *richness*. This perhaps sounds ambiguous. I mean that in point of richness, which I assume to depend upon the oil content of the fruit, the best Mexicans and the best Guatemalans are nearly equal, but there is a certain flavor, not dependent upon the oil content, which characterizes each of the races.

Of course, if richness is not dependent upon the oil content but upon some other factor, then we will have to begin all over and find some other means of comparing the two races.

Some people prefer a Gravenstein, and some a Northern Spy, but no one maintains that both are not good apples. The flavor of the Gravenstein appeals to some, that of the Northern Spy to others. I believe it will be the same with these two races of avocados, the Guatemalan and the Mexican, and that there will always be a demand for both, though I do not expect the Mexican to sell so extensively, by any means, as the Guatemalan.

H. Veracruz, September 20, 1918.

NOTE—"The classification of the Fuerte and Puebla varieties is still in doubt." Since writing this I have visited Atlixco and have examined the parent trees of both these varieties. It is evident that Puebla is a true Mexican, while Fuerte bears many indications of being a hybrid between the Guatemalan and Mexican. It is not representative of any group or class found in this region, but appears to be *sui generis*.



Plate XII.

Along the Aqueduct to Queretaro

Avocado groves on both sides with a few Cherimoya trees in the foreground.



Plate XIII.

The Best Orchard in the Canyada

This five-year-old orchard is planted to alfalfa. It is irrigated every three weeks, and is a heavy bearer.

WHAT ABOUT THE MARKET?

GEO. S. McCLURE, RIVERSIDE, CALIF.

What about the market? I think that is about the commonest question I hear in regard to the avocado, and I hear it from two sides. You opulent rich, who have a few trees are wondering how long you can net a dollar a pound for your fruit; and the common people, who have to worry along with nothing more profitable than banks, gold mines and oil wells to provide the where-with-all, are wondering if the time will ever come when it will be safe to acquire an avocado appetite.

As the members of this association seem to wear the smile of the man who "has his," let us consider the question from the seller's point of view.

It is really startling to make figures on the probable profits from avocado growing. No matter how conservatively you figure, your results will appear far too rosy. A theoretical calculation is pretty sure to look something like this: You are now getting from seventy-five cents to one dollar each for fruit averaging about a pound in weight. Basing our estimate on individual trees, an acre of avocados of the best variety will produce at least ten thousand pounds of fruit in a year. The cost of producing this fruit, after the trees are fully established, is about two cents a pound; leaving a net profit of \$9800 an acre. It sounds like the chicken story doesn't it? Of course, it cannot be proved either true or false because there are no acre groves of full bearing trees of the better varieties, but there are several trees in California, the average annual crops of which reduced to an acre basis, would produce a still more startling estimate.

I will try, therefore, to be as conservative as possible in speaking of the conditions as I actually know them, and I hope you will pardon me if I refer especially to Florida where the growers have already started to market their fruit in the open markets of the north.

Prices of all commodities are regulated by supply and demand. There is at present practically no supply of avocados. There never can be a large supply, for the territory suitable to their culture is very limited. In the United States it is limited by temperature to a small area in California and another in Florida. These two areas combined would hardly equal in size the state of Connecticut. In the countries to the south of us, supply is limited by the happy "go-lucky" characteristic that limits the vision to *manana*, or at most *pasado manana*. To put his money and time into something that will produce no returns for several years is not the way of our Latin neighbor. American capital may plant to some extent in Cuba and Porto Rico though I have seen but two small plantings of commercial varieties in the West Indies and I do not know of any others. Lack of rapid transportation will also limit competition from the tropics. I cannot see where any supply can ever come from, that would supply the United States, should the consumption per capita ever reach that of Southern Florida or Cuba.

It is safe to say that the average consumption in Havana is more than a quarter of a pound per day during those seasons when avocados can be bought for less than seven cents a pound. Should the per capita consumption in America ever reach one-fifth that of Havana it would require 5,000,000 pounds a day or 1,500,000,000 pounds for the three hundred

days of each year that our present varieties should cover. This would be the product of 150,000 acres at the rate of 10,000 pounds per acre.

Will the American demand ever equal this one-twentieth of a pound a day? I assure you that it will not at one dollar a pound. I feel sure it will if the supply ever reaches the point where avocados can be bought at ten cents a pound. The avocado taste is no more an acquired one than the taste for potatoes. I imagine Sir Walter Raleigh must have had quite a job convincing the English that potatoes were really good to eat, but there are quite a few of them eaten today; even if you can carry home a dollar's worth in a paper bag.

The taste for tomatoes has but recently been acquired, but the entire acreage in the United States suitable to avocado culture, if solidly planted, would not supply the demand if avocados were eaten as generally as tomatoes.

Miami, Florida, offers perhaps the only example of how the avocado will be accepted by the American people when a supply becomes available. There are a great many seedling trees scattered about in the door yards and in small plantings near town. These fruit ripen in the late summer and early fall. The average price during that season when the fruit is plentiful is about twelve cents a pound. When it drops below this figure the consumption increases and the price quickly swings back to normal. If the crop is light and the price is above twelve cents, the consumption by the laboring classes falls off, but at twelve cents a pound, avocados take a substantial place with other nutritious foods even among the negro laborers; and I would estimate that the average daily consumption in Miami during August and September is fully one-fourth pound per capita.

In October when the seedling crop disappears the price of budded fruit rises and the demand continues from the skilled labor and business classes until the price reaches twenty cents a pound. In November the price reaches twenty-five cents a pound and the consumption is then limited to the more prosperous classes. This would seem to indicate that fifteen cents a pound is about the price at which the avocado can be considered a staple food necessity among the American people. That the price would be a little higher in localities where the avocado is not grown locally is indicated by the demand in New Orleans, Mobile, Key West, Jacksonville, New York and other Gulf and Atlantic ports, where considerable fruit is shipped in during the late summer from the West Indies. South Florida growers are also shipping their second grade fruit to the interior southern towns and the demand in these markets is increasing so rapidly that in some cases cull fruit is bringing a fancy price.

When I first became interested in the avocado, the few Trapp fruit that were being shipped North from Florida, were netting the growers three dollars a dozen or about twenty-five cents a pound. Even the wildest optimist admitted that this price could not continue, but even if it dropped fifty per cent, they would still have a big profit. That was twelve years ago. Instead of dropping, the price for late fruit has advanced until within the past year or so, net returns of fifty cents a pound have occasionally been received. This price is due not so much to the superiority of the budded varieties, but to the fact that nearly all the seedling Florida and West Indian fruit is then off the market.

The Florida avocados are usually shipped in tomato crates somewhat similar to our orange boxes, but holding only about forty pounds. The fruit is packed in excelsior and is not wrapped, as it was found that paper wrappers tended to the ripening of the fruit in transit. The shipments are made by express without ice and usually reach the Northern markets in good condition. Some fruit is being shipped from Florida to this coast in refrigerator packages and, I believe, netting fair returns.

Regardless of what we may think of the superiority of our California varieties, most of the fruit reaching the large centers of population, are of the West Indian variety, and all shipments of Guatemalans into these markets should contain clear instructions about their ripening. The West Indian ripens from the seed toward the skin, so that when the fruit shows the first sign of softening it is ready to use. The Guatemalan varieties I have eaten, ripen from the skin toward the seed; and after spoiling several fine fruits by cutting them before they were ripe, I have adopted the plan of keeping them until they were fully ripe by West Indian standards, and then wait about three days longer. For this very reason I believe the California avocado will ship better than the West Indian varieties, but unless the Eastern buyer is warned he will try to eat it too green and, of course, condemn it. Even a good Californian of many years residence told me last fall that he had just eaten a Taft avocado and that it was tough and tasteless. He said he knew it was ripe because it was fully as large as the purple fruit he had been getting. When I told him that the Taft when mature should have been several times as large as the one he had eaten and should have weighed a pound or more, he said he did not know any California avocados ever got that large. He had eaten it all and was still living, so I suppose green avocados are not fatal any way.

It is said against the avocado, that it cannot be cooked. To me it would appear to be an advantage that it can be eaten and is at its best without cooking and without processing.

The objection of some that it cannot be canned or preserved except by refrigeration is met by the wide seasonal range of maturity. It is needless to preserve them if we can keep up a constant supply right from the trees.

While it is likely that for many years to come the price of avocados will keep them in the luxury class, I feel sure that should the production ever become large enough, they will take a firm place with the other nutritious foods and will find a ready sale to the masses at prices several times the cost of production.

That the avocado is really a natural food is evidenced by the fact that it is considerable of a question to protect the fruit on the trees from the depredations of wild animals. The raccoons are specially fond of them and even after a "coon" is caught in a steel trap while after his favored food, he will continue contentedly eating away as long as there is a ripe avocado within his reach, blissfully oblivious to the pain from the sharp steel jaws of the trap.

I have been asked why it is, that since Florida has been producing avocados commercially for a dozen years or more, there are not as many named varieties as there are in California? I answer that by stating that if every individual seedling tree that bears good fruit of a slightly different

size or shape or season, had been given the proud name of its owner, the Florida grower would be deluged with a thousand different names.

As to what variety will ultimately be the most popular on the market, I could not hazard even a guess. The reason the Trapp variety brings a higher price than the seedlings, is not because of its superior flavor, but because it gets into the market when most of the Florida and West Indian seedlings are gone.

Nor would I dare to name a preference for the fruit of any particular type nor from any particular locality, though I can say that the best flavored fruit I have ever eaten was a Fuerte from Mr. Whedon's grove at Yorba Linda. In fairness I must add that there are many of the California named varieties that I have not yet been fortunate enough to sample.

PROPER MATURING OF AVOCADOS

BY PROFESSOR I. J. CONDIT, UNIVERSITY OF CALIFORNIA

The history of fruit marketing in California abounds with accounts of the sales or attempted sales of early season fruits in order to benefit from high prices. This is the time of the year when we read in the press of the fancy prices paid in Chicago, Boston, or New York for the first box of cherries from Vacaville, apricots from Red Banks, or figs from Coachella. The saying that "most people eat with their eyes" is true with regard to a number of California fruits, but we must all admit that however attractive early apricots, peaches, or cherries may appear to the eye, their flavor and quality are as a rule decidedly disappointing to the taste. California Navel oranges may be picked when green, sweated to produce color, and sold at fancy prices in the Eastern market, but the consumer's appetite for more is, to say the least, certainly not stimulated. The marketing of ripe olives for pickles reached such an unsatisfactory state recently that a maturity standard for this fruit has been established. The selling of immature avocados in California has been practiced for several years and it seems at times unfair to censure the grower who handed over the fruit to the purchaser at 50c, 75c, \$1.00, or even \$1.50 each rather than leave it on the trees to suffer possible injury or total loss from wind, frost, or theft. In the discussion of this subject, therefore, it seems best to treat it under the following headings:

The need of a maturity standard for the avocado.

Maturity standards for other fruits.

The possibility of finding such a standard for the avocado and of enforcing it.

Is there a need of a maturity standard for the avocado? According to the opinions expressed by experienced growers it would seem that there is. Some of these expressions are as follows:

"My personal opinion is that anyone offering immature avocados, while knowing them to be such, should be censured in the highest terms. It seems to me that, in the inception of the avocado industry, when not one person in one thousand has ever tasted the fruit, a special safeguard should be thrown around the quality of those offered for sale."

"Regarding the sale of immature avocados, I deprecate it. In these young years of the industry, it should not be done."

"I am decidedly of the opinion that the injury to the market, due to the selling of immature avocados is very serious and widespread, and it must be that many people who taste an unripe avocado, having paid a high price for it, are prejudiced against the fruit and deterred from buying again."

"In the cultivation of the taste of the public for avocados I believe there is much injurious work done by selling immature fruits. I do not think the present market has been greatly injured because there is so much greater demand than supply, but I believe the appreciation of the public, and especially the cultivation of the taste, is greatly injured by the immature fruits that have gone out. These fruits have sold at good prices because the public in buying them thought they were getting ripe avocados. Naturally, finding the fruits inferior, the people who bought them will value the avocado accordingly, and have a poor opinion of it instead of a good one. An adverse opinion is more difficult to overcome than a low price. I believe we should take a strong stand on this subject of putting green fruits on the market. There is and can be no justification for this practice, and all growers should feel too much interest in the future of the industry to take a hand in dealings of this nature."

"I think the sale of immature avocados one of the greatest menaces to the future success of the industry and a maturity standard most desirable."

"I am sure it will be hard to get the people who have purchased immature fruits ever to try again and therefore it would seem to me that the market was damaged to the extent and amount such fruit has been sold. Certainly it should not be practiced if there is any way to stop or check it."

"I think that it is a very serious injury to the development of the market for avocados, to have undeveloped fruit offered on the market. It is especially harmful because the average salesman and customer are not capable of judging whether a fruit is good or not. I doubt if any legal method could be arrived at at the present time by which a maturity standard could be enforced, but think that a remedy probably lies in the education of produce men, and the development of a better standard among the growers."

That there is another side to this question, however, is indicated by the following letter:

"In answering yours of April 25th, I have to acknowledge that my ideas in regard to the value of immature avocados have been very much disturbed by things which have occurred during the past winter."

"When some growers marketed fruit which had been blown off the trees and which seemed to me should have remained on the trees from three to four months longer to bring them to perfection, I was quite indignant and felt that the persons who bought the fruit at the retailer's had been very unjustly dealt with."

"I have had to modify my opinion very materially, as I have had a remarkable evidence of the value of avocado fruit even many months before it was thoroughly ripe. An orchard at Whittier had among its trees a Murrieta Green, the fruit of which is not expected to mature before July or August. The top of this tree, bearing twenty odd fruits, was accidentally blown off and the broken part thrown aside. The fruits were not even

full grown. About a week afterward I happened to see this and testing one of the fruits found that it was very fair in its qualities. The grower then tested them with me and agreed with me as regards their availability. In fact, all of them were used and I may make a comparison by saying that they were just as good as fruit of the Lyon variety which was picked from the same orchard and which was supposed to be mature at about this time. The incident above occurred in February.

"In contrast to this, I saw some of the smaller avocados which were blown off last fall which were sold about town, which were absolutely worthless in every respect and which made one feel that a law should be passed, putting avocados on the same plane as immature oranges."

It is a well-known fact that immature avocados have been imported from Tahiti for a number of years. The fruits are picked before they are full-grown and shipped under refrigeration. Such avocados satisfy the epicure who has an extravagant desire for things rich and rare, but not the connoisseur who is able to judge quality in fruits. Immature avocados are very satisfying when dished up with a highly-seasoned French dressing, but why pay an exorbitant price for the privilege of enjoying the dressing? Why not pour the dressing on equally tasteless but less expensive food?

The California growers have less to fear from the marketing of fruit blown from the trees prematurely than from the individual who sells his fruit green simply because he is in a hurry for his money. It should therefore be the aim of the Association to establish and maintain some sort of a maturity standard for each variety.

It has already been pointed out in previous meetings of this Association that we must not conclude that a fruit having a high oil content is necessarily of superior quality. Let me quote Prof. Jaffa in the 1916 Report, p. 88: "In fact it might be said that in some instances a fruit with a medium oil content might be more desirable than one with a higher content as is oftentimes the case with milk, the Holstein being preferable to the Jersey on account of the fact that the latter is too rich in fat."

Although analyses of the same variety differ somewhat, Prof. Jaffa points out that those varieties which yield a high percentage of oil will do this consistently under proper conditions, while those which yield a lower percentage will probably not increase the percentage materially by any treatment which may be given to the culture of the respective variety.

While we will all agree that a half or three-fourths grown avocado will soften and become edible even though not very palatable, we must admit that the same avocado would be incomparably more satisfactory if allowed to reach a more mature state on the tree. Note, I say a "more mature state"; if left on the tree too long the flavor and quality is very likely to be impaired. An increase of from 26 to 28 per cent in fat content has been accompanied with a much poorer quality of fruit.

Analyses of the fruit at Berkeley certainly show that the oil increases with the ripening but the correlation between the percentage of oil and the best edible quality has not been determined.

Immature Chappelow fruits analyzed Sept. 24, 1915, showed 13.86 per cent fat; mature fruit of the same variety analyzed three days earlier showed 29.10 per cent fat. Immature Challenge fruits showed a range of 2.66, 5.78, 6.71, 7.75 per cent fat while more mature fruits showed a fat content of 16.37 per cent. Immature Fuerte fruits picked October 10,

1916, showed 11.61 per cent fat; those picked in January, 1917, showed 24 and 25 per cent, those in May and June from 26 to 30 per cent.

According to Mr. J. M. Elliott, who interviewed Rivers Bros. & Co., which purchased the bulk of the avocados blown from the trees last November, the fruits within three weeks or one month of maturity were not damaged at all and under proper conditions ripened normally. These proper conditions undoubtedly include a certain percentage of humidity as well as warmth, since dry air will cause the fruit to shrivel, dry up, and become leathery. Some persons have found that avocados ripen more uniformly and quickly if buried in bran or sawdust than in the open air.

MATURITY STANDARDS FOR OTHER FRUITS ORANGES

Both in Florida and California there is a strong tendency to begin shipping oranges and grapefruit early in the fall before the fruit is properly matured. The incentive is the high price obtainable for anything that looks like an orange at a season when the market is practically bare of oranges. The Federal Pure Food Board decided in 1911 that sweated or artificially colored oranges were regarded as adulterated in the sense that inferiority was concealed, and therefore unsaleable unless plainly marked, "Sweated." In 1913 the Florida Legislature passed the immature fruit law forbidding the shipment of green fruit, between September 1 and November 5 of each year, which shows by test to contain in orange juice more than 1.3 per cent of acid or in grapefruit juice more than 1.75 per cent of acid. However, any fruit which showed on the tree or within 48 hours after being picked, one-half yellow color, indicating ripeness, was considered mature and exempted from the acid test. This law was the first in this country or in any country so far as I know, to hold fruit shippers to an arbitrary maturity standard.

Chemical investigations of oranges were made in California during the fall of 1913 by agents of the U. S. Bureau of Chemistry and as a result the Chief of the Bureau suggested to the Citrus Protective League that a standard of eight parts of total solids to one part of acid in the juice be adopted. The Tulare County Protective Association formed in 1914, agreed to abide by this standard, the Exchange prescribed it for the "Sun-kist" brand, and several counties in central and southern California passed ordinances prohibiting shipments of oranges falling below the standard. The 8 to 1 standard was embodied in the Fresh Fruit Standardization Law in 1917, with a "substantially colored" clause added. The State Horticultural Commissioner provided color charts to guide inspectors as to the meaning of "substantially colored." The state law has recently been amended so as to add a color standard of 25 per cent before picking in addition to the eight to one standard.

GRAPES

On account of the difficulty experienced over the shipments of table grapes of varying degrees of ripeness a maturity standard for such fruit was included in the Fresh Fruit Standardization Law, Section 8a reading as follows: "Table grapes, when packed, shall be of practically uniform quality and shall be well matured and show a sugar content of not less

than seventeen per cent Balling scale except Emperor, Gros Coleman, and Cornichon which shall show not less than sixteen per cent Balling scale." The Division of Viticulture, Berkeley, examined nearly 400 samples of grapes being packed for shipment, each sample being tasted and judged by from four to six persons. The results indicated that the standard of 17 degrees Balling is about right as far as the public taste is concerned. During the shipping season numerous inspectors are employed to test the sugar by means of saccharometers in order to keep the fruit up to standard.

OLIVES

Since the avocado is more nearly comparable to the olive than to any other fruit commonly grown it is interesting to note the standards adopted for the latter fruit.

Investigations made by the Bureau of Chemistry showed that the index of maturity for olives is the oil content of the flesh. As a tentative standard of maturity for Mission olives and other common varieties except Manzanillo, Ascolano, and Sevillano, an oil content of 17 per cent in the flesh is regarded as a minimum. The Manzanillo olive should contain a minimum of 15 per cent of oil in the flesh to be regarded as ripe or mature.

These regulations for olives, however, have little practical value to the grower since he cannot make an oil analysis himself and even if he could do so the process requires too long a period as a rule to have much value. In general growers are advised not to pick olives for ripe pickles before a specified date unless a certain amount of color is developed; after that date the fruit is picked regardless of color. Green fruit containing less than 17 per cent oil can be pickled, packed, and sold as long as the product is not labeled "Ripe olives."

CANTALOUPE

The U. S. Bureau of Markets in May, 1918, called attention to the fact that at certain periods fully one-fourth of the cantaloupes shipped are so immature when they reach consumers as to be unpalatable and not of fair eating quality. Green melons have a depressing effect on both demand and price. If only one per cent of the annual production of the Western States should be picked and shipped green, consumers would buy more than 40,000 crates of cantaloupes that have nothing to recommend them as food. Instead of only one per cent fully ten per cent were in 1918 green when they reached far distant consumers. To insure the best eating quality when consumed as well as good carrying quality it was recommended that cantaloupes be picked just before they will slip cleanly from the stem.

The State Standardization Law reads: "All cantaloupes when packed shall be fully netted, of uniform size, firm and mature."

A satisfactory maturity standard for all avocados will be difficult to establish. Nature has endowed the Sharpless, Dickinson, Challenge, Spinks, and others with a fairly sure sign of maturity in the final change of color from green to purplish—or reddish-black. With those varieties which remain green throughout, the problem is more complex. An oil analysis will not suffice as such an analysis requires too much technical skill to be used widely and the individual fruits show too much variation in fat content as influenced by the long blooming period of the tree and the irregular set-

ting of the fruit. Neither will size of fruit suffice as sizes also vary markedly on the same tree. It seems to me that the most logical basis for a workable standard is the normal date or season for maturity. Varieties have already been classified according to season, the Fuerte from January to May, the Sharpless from October to January, the Puebla from December to February, and so on. Why can not the Committee on Classification and Registration of varieties be authorized by the Directors to submit recommendations as to the earliest date at which the fruit of a commercial variety can be termed properly mature? The Directors can then draw up an agreement according to which the members of the Association promise not to pick and ship the fruit of any commercial variety before the maturity date specified for that variety. The containers for the fruit could then be plainly labeled, "Mature Avocados, Guaranteed by the California Avocado Association." It was some such arrangement as this and not an iron-clad contract by which the Tulare County Protective Association secured excellent results in preventing the shipping of immature oranges. The members made it decidedly unpleasant for growers who did not make the agreement or who failed to live up to it when made. This whole subject, however, of the proper maturity of avocados is one which needs thorough investigation and it is to be hoped that such an investigation can be carried out by the Association, the State Experiment Station, or by the United States Department of Agriculture.

EARLY INTRODUCTION OF THE AVOCADO INTO CALIFORNIA

BY JUAN MURRIETA OF LOS ANGELES

I have been asked by some members of the California Avocado Association to make a report of my attempt to introduce the aguacate into Southern California, and to do so I have to call upon my memory for the facts, as I made no written record at the time. Mr. J. C. Harvey, a gentleman who has travelled much, first called my attention to the tree and he gave me an aguacate seedling, which I planted on my place at College St. in 1891. This produced a small dark fruit of delicious nutty flavor, and a person that tasted this small fruit who had a great deal of knowledge in aguacates, by having been in Mexico, claimed that the nutty flavor in this fruit was a flavor not found in any of the paguas from Mexico, and he considered this fruit about the best aguacate. I think Mr. Harvey obtained the seed of this tree from Mexico and at the end of seven or eight years this tree died, but the new trees from seed of the old tree were left at College St., when I sold the place. Mr. Harvey had aguacates and paguas trees, these being the distinguishing Mexican names between the thin skinned and thick skinned varieties.

Mr. Buddington of Alpine St. had one tree and Mr. Miller of Hollywood another one. I became much interested in this fruit and Mr. Harvey reserved a few he had for his own use. I determined to look elsewhere and learned from the Wells Fargo Agent here that they had an agent in Atlixco, Mexico. I wrote then and very fortunately in this way opened correspondence with a very intelligent gentleman, Mr. Fuentes. In January,

1893, and for more than two months thereafter, I received from him shipment of paguas, which were received through the Express Company in good condition. Later, however, he began to ship me aguacates, which, owing to the heat in crossing the desert, reached me in such bad condition, that for the future, I ordered only the thick skin variety which I was convinced by experience were the only ones fit for the importation in this way, and the most interesting fruit for commercial purposes. I planted the seeds from this fruit and my friends, noting the beauty of the trees and later the fineness of the fruit, became also interested. This fruit, which was hitherto almost unknown here, became much better known.

Later I gave my friends both seeds and young plants. I recall Mr. Cecil C. R. Sumner of Hollywood who owned the place now owned by Mr. Walker. No doubt the trees given to Mr. Sumner produced the Royal, Challenge and the Walker Prolific. I also remember Mr. R. M. Pogson of Hollywood has planted several of the trees given to him and Mr. Habersham of the same place, the seeds given to him producing the Dickey No. 1 and No. 2, and the Blakeman. Mr. Taft of Orange was much impressed by the fruit grown on my home place and took buds from the best trees that I had on my place. Mr. Garcia, whose place is at the foot of the mountain, east of the place of Mr. W. A. Spinks, was delighted to see the fruit on the trees at my place and bought buds from all the trees and made a great success in producing the best fruit in California. Popenoe of Altadena obtained buds from several of the trees which I had grown from seeds. Mr. E. S. Thacher of Nordhoff, Ventura County, took great interest in the aguacate fruit and when he found the good quality of fruit that I had on College St., raised from fruit imported from Mexico, bought a great many buds from the Murrieta Green and Murrieta Purple.

It has been a great pleasure to me to watch the progress of this favorite fruit, and I am glad of the great interest that this Association has taken in this matter. No doubt with the help and careful attention in this new enterprise from this Association, great benefit will be not only to Southern California, but also to the people that may select the new idea to raise this magnificent, interesting and profitable avocado.

Any experience I may have gained in developing this new industry, I shall be more than happy to help this Association with. I feel sure that failure of the tree in some instances to meet expectation, is largely the result of inattention or one of knowledge as to the needs in a climate to which it is foreign.

DISCUSSION OF MR. MURRIETA'S PAPER

BY C. P. TAFT OF ORANGE

I would like to say a few words of appreciation of Mr. Murrieta's paper. Perhaps not all of us realize how much we are indebted to him as one of the pioneers of the avocado industry. In addition to growing trees of his own and producing such valuable varieties as those grouped together and called the Murrietas, he has from time to time distributed quantities of the best obtainable seed from Mexico. On two occasions I obtained such seed from him. Of the first lot probably the Sharpless was the best. I sold the young tree to Mr. Gockly who was the owner of the Sharpless

ranch before its present possessor, Mr. Sharpless. On my own property I have several mature trees bearing fruit of considerable value out of this lot. The second lot has resulted in trees of very promising appearance, possessing characteristics quite different from their predecessors. None have yet borne, but the bloom has appeared on some, so probably we will know what the fruit is in a year or so.

I should have mentioned above that the so-called Smith-Clark tree of Villa Park, a variety of undoubted value is from one of Mr. Murrieta's introductions.

THE AVOCADO IN SANTO DOMINGO

NOTES BY SENOR JOSE RAMON LOPEZ, DIRECTOR GENERAL OF THE
BUREAU OF STATISTICS

AVOCADO—Family of Lauraceous—Persea Gratissima—Guertner-Laurus
Persea—Linneo.

The tree is from 5 to 15 meters high with fairly wide branches, starting at about two meters from the ground.

LAND

The best soil for the avocado is the humus (mouldy), almost pure. It prospers also in soil of inferior quality, but with less exuberance.

TEMPERATURE

The best climate in this country is the one with temperature in summer from 34.5 degrees to 35 degrees C., nevertheless this does not hinder it from bearing in heights of 1.000 or more meters above the level of the sea, and where the heat never attains more than 28 degrees and in winter goes down to 0 deg. C.

VARIETIES

Avocados are classified by the form of their leaves. There are three classes in the Dominican Republic, "Oblong," "Macrophilla" and "Vulgaris," but the usual way of selecting them here is by the color and size of the fruit. There are purple avocados and green avocados.

These differences in classes are also subdivided in large and small, round and piniform necks.

The smallest size in this country weighs more than a pound, the largest exceeds three pounds and often weighs four pounds. The seedless kind grown in Florida, U. S. A., has never been imported nor grown in this country.

TASTE

As a rule, the largest avocados of any form, color or class are the better tasting. Besides its excellent flavor, slightly sweet, it leaves an agreeable impression on the palate, such as curded milk or butter. These are called *Sebosos*, (greasy). Others also very agreeable are very sweet.

The kind least appreciated have a very small proportion of grease and plenty of water and in color resemble wild grass. These are used for nourishing pigs.

THE BEST AVOCADOS

The avocados of the Province of Espailat are famous for their size and flavor, although similar classes abound in other parts of the Republic. In the neighborhood of San Cristobal, Province of Santo Domingo, there are classes that compete advantageously with the Pollock.

There was a tree in the yard of house No. 67, Sanchez Street, that gave avocados of a green color, round shape, and weighing over three pounds; the pulp of same was about one inch thick at the lower end. This tree died in 1917.

In the yard of a house fronting Mercedes square, that belongs to the Church of the same name, there is a tree that bears the Piniform Neck, of more than three pounds weight, and of excellent taste.

FRUCTIFICATION

Trees begin to bear five years after planting, and often earlier if the soil is good.

...

EXTENT OF CULTIVATION

To the present date nobody in this country has developed an avocado plantation. In each *Conuco* (little agricultural patch) there are one or more trees that have sprung up from seeds thrown away after the pulp has been eaten.

DIFFERENT WAYS OF EATING

The manner of eating preferred in the cities is by cutting the avocado in small slices when at the table, and mixing them with the soup, taking a slice with each spoonful of soup. It is also consumed in slices sprinkled with powdered salt and sometimes adding a bit of pepper, and generally accompanied with meat or food. Salads are also made of the avocado, alone or mixed with salted fish; in this last way the character of the salad is changed from dietetical to aperitive. Some persons smash it with salt and vinegar, while others sprinkle it with sugar, making a delicious dessert.

NOTES ADDED BY J. H. PENDLETON

BRIGADIER GENERAL U. S. MARINES

The favorite manner of eating the avocado among Americans is to cut the fruit in two lengthwise, removing the seed, and eating the pulp with a spoon. I like them best with a sprinkling of salt, occasionally adding a light squeeze of lime, preferably green. Many people put a little French dressing in the hollow of the half-fruit. Some use ketchup, or a cocktail sauce of ketchup, worcestershire sauce, vinegar or lime, and a drop of tabasco. Many people sprinkle the fruit with sugar and squeeze a little juice of lime on it. Some serve the pulp of the fruit cut in dice with a cocktail sauce, similar to a fruit cocktail. Sometimes it is diced and mixed with other fruits in a cocktail, and with vegetables in a salad. A delicious puree is made by mashing the pulp and using it as one would use green peas in making a puree.

CLASSIFICATION AND REGISTRATION OF VARIETIES

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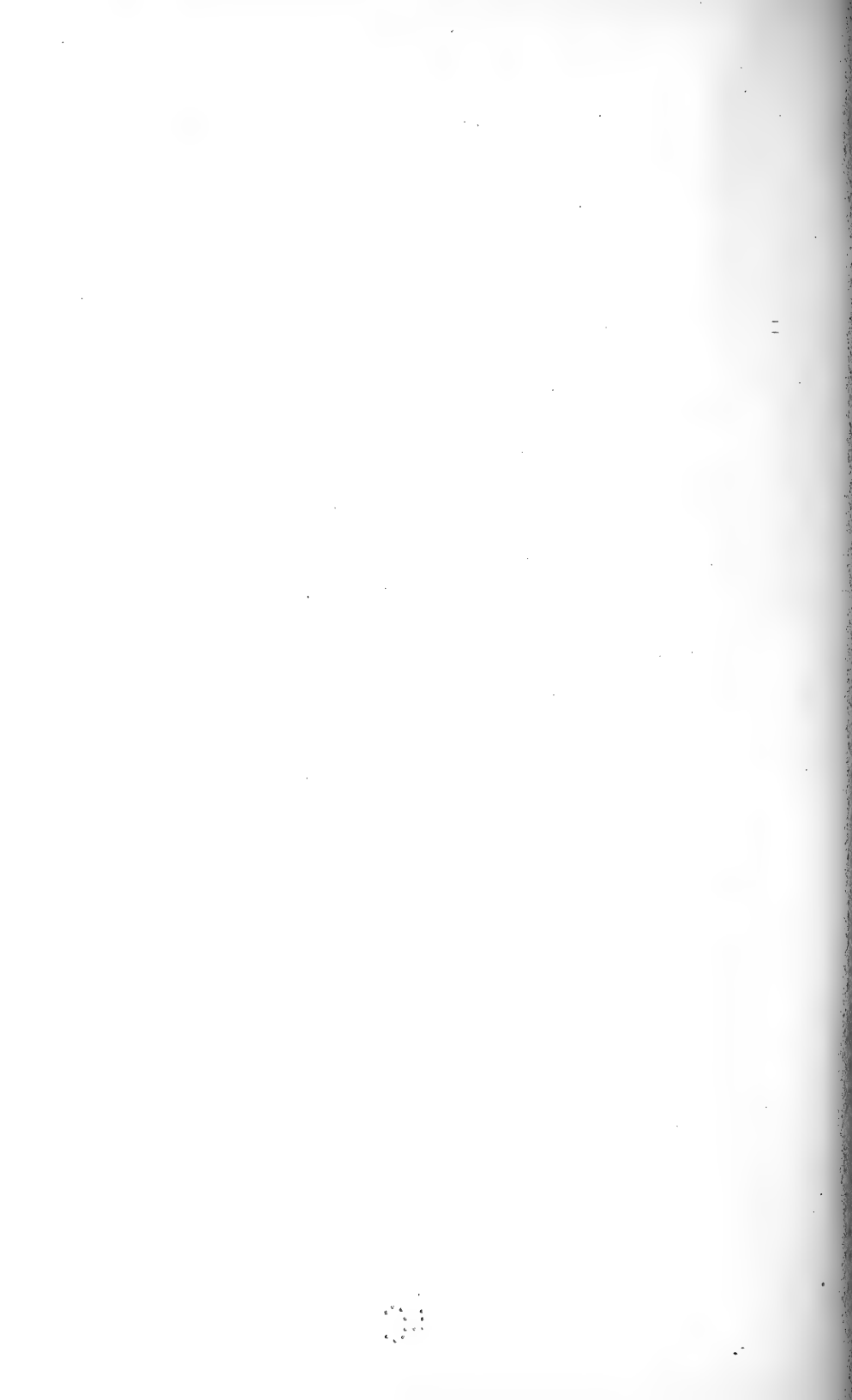
T. U. Barber
Wm. Hertrich
C. F. Kinman

L. B. Scott
A. D. Shamel
H. J. Webber

The committee on the classification and registration of varieties meets regularly on the third Tuesday of each month to consider the merits of any new varieties which have been suggested, and also to consider any additional data which may have been submitted relative to the eight varieties which have been recommended by the committee.

All growers are earnestly requested to co-operate in this work. Anyone having knowledge of a new variety of merit should communicate the fact to the chairman of the committee, and if possible send a sample of the fruit by parcels post so that it will reach him before the third Tuesday of the month.

Growers are also requested to keep individual tree records, so that the committee may have on file complete information relative to the new varieties and also to the varieties which have already been recommended. Blank forms for these records may be obtained from the Secretary of the Association.



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"* * * but an occasional variety which I have found in Guatemala has impressed me, viewing it as impartially as possible, as FAR SUPERIOR to anything which I have ever found in California. The flesh is of deeper yellow color, smoother, more buttery texture, and richer flavor THAN IN ANY VARIETIES YET KNOWN IN THE UNITED STATES."

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Since the Sharpless fruit first came to the notice of Avocado experts it has been pronounced of exceptional merits as a commercial variety because of the desirable size, fine quality and flavor of the fruit, small seed in proportion to the edible portion, hard thick skin, making it a fine shipper and also from the fact that the skin changes from a dark green to a dark rich maroon color, as it ripens, thus obviating the danger of picking and putting on the market unripe fruit.



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Our budding this season is mostly to the standard varieties advocated by the Avocado Association, with a few other sorts which seem quite promising.

Lyon, Fuerte, Dickey A (Habersham) Puebla, Spinks, Sharpless, Linda, Queen, Ganter, Dickinson, Northrup, etc., and No. 2 and No. 15, two choice varieties from budwood we imported from Atlixco, Mexico.

No. 2, large fruit, small seed, spring and possibly a winter sort. No. 15,

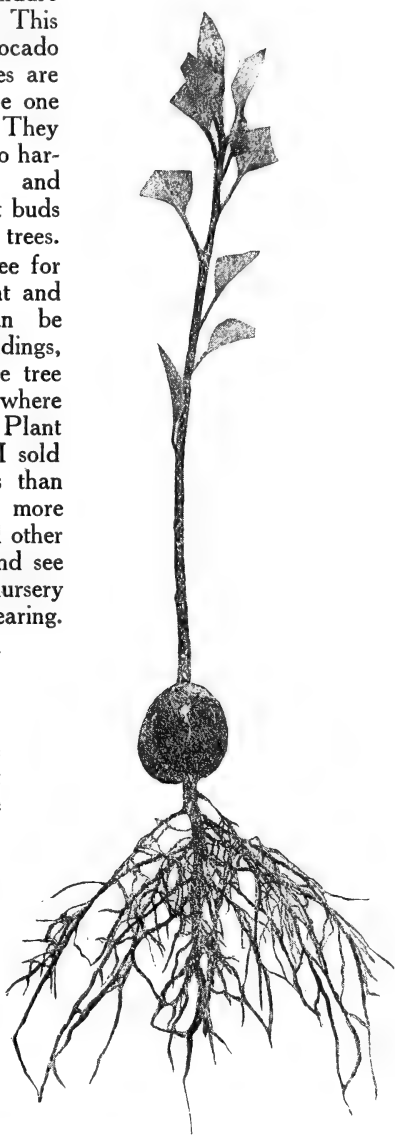
See next page.

Any substantial structure to endure must have a solid foundation. This same rule applies to the avocado trees. All of my nursery trees are raised from trees similar to the one pictured here on this page. They are all field-grown from seed to harvest and guaranteed, root and branch. I select only the best buds from the choicest performance trees.

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All welcome to visit my orchard or nursery only on week days. No business whatsoever done on Sundays.

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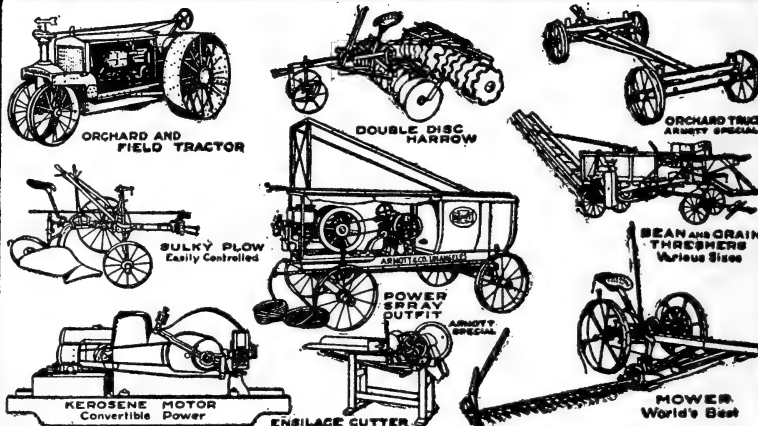
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Annual Report
1919 and 1920

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FRUITS FROM THE PARENT FUERTE AVOCADO TREE

Alejandro Le Blanc, Jr., is here shown holding several avocados of the 1918 crop from the parent Fuerte tree. When told of the present importance of Fuerte in California and its probable future value to the avocado industry Senor LeBlanc expressed himself as delighted that he had been able to give to horticulture something of merit.

ANNUAL REPORT
OF THE
CALIFORNIA AVOCADO
ASSOCIATION
FOR THE YEARS
1919-1920

Including Reports of the Semi-Annual Meeting held
in Santa Barbara, October 24-25, 1919
and the Fifth Annual Meeting
held in Los Angeles
May 7-8, 1920



LOS ANGELES, CALIFORNIA
July, Nineteen Twenty

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NOTICE. The Association does not hold itself responsible for the opinions and statements expressed by the authors of the various papers published in this report.

The illustrations used in the report must not be taken as illustrating the most desirable varieties. They are used as a means of illustrating the range of variation.

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A resolution passed by the Board of Directors June 3rd, 1919, provides that the names of members who are delinquent two years in the payment of their dues shall be taken from the list.

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- COIT, PROF. J. E., College of Agriculture, Berkeley, Calif.
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- POPENOE, WILSON, Explorer, U. S. Department of Agriculture, Washington, D. C.
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Minutes of the Semi-Annual Meeting of the California Avocado Association held at Hotel Belvedere, Santa Barbara, October 24th and 25th, 1919.

WM. H. SALLMON President
J. M. ELLIOTT Vice-President
W. L. HARDIN Secretary and Treasurer

The meeting opened with a dinner at the Belvedere at 6:30 p. m. at which 130 members and guests were present.

Avocados which were furnished by the Association were served at the dinner in cocktails, salads, and in the ice cream. President Sallmon called attention to the table decorations in the form of sprays of avocado leaves and blossoms and clusters of the seedless fruit. These decorations were furnished by Miss Sexton of Goleta, who, with the assistance of Mrs. Keller of Yorba Linda, arranged them on the table.

At the conclusion of the dinner, President Sallmon proposed a toast to the health of the President of the United States, to which the members and guests heartily responded.

Following the dinner, a most interesting and instructive stereopticon lecture was given by Mr. Wilson Popenoe of the U. S. Department of Agriculture on

EXPLORING THE TROPICS FOR AVOCADOS.

Many beautifully colored slides were shown on the screen.

On Saturday, October 25th, the following program was presented, with the exception that Mrs. Stewart, Mr. Taft and Mr. Barron, of the first paper, were unavoidably absent. Mr. Barron sent a comprehensive report covering the San Diego district which was read by Mr. Elliott.

SATURDAY FORENOON, 9:30.

Informal address, President Wm. H. Sallmon, San Diego.

Symposium on the June Drop—Led by J. M. Elliott, Los Angeles, assisted by Mrs. J. T. Stewart and Messrs. E. S. Thacher, C. P. Taft, F. O. Popenoe and A. Ellis Barron.

TOP-WORKING OLD AVOCADO TREES, Dr. Will R. Manning, Fillmore.

GROWING AVOCADOS FROM SLIPS, S. W. Jamieson, Burbank.

SOME THINGS WE HAVE LEARNED, Wm. A. Spinks, Duarte.

SATURDAY AFTERNOON, 1:30.

THE SELECTION OF ROOT STOCK FOR BUDDING, Dr. H. J. Webber, University of California.

ATLIXCO, Wilson Popenoe, U. S. Department of Agriculture, Washington.

THE KEEPING OF INDIVIDUAL TREE PERFORMANCE RECORDS, A. D. Shamel, U. S. Dept. of Agriculture, Riverside.

REPORT OF THE COMMITTEE ON VARIETIES, Chas. D. Adams, Upland.

Ample time was allowed for discussion after the reading of each paper, and the members took part freely.

During the forenoon meeting President Sallmon introduced Dr. David Fairchild of the U. S. Department of Agriculture at Washington, who gave a most interesting and instructive talk on some of the general features of the avocado industry.

A very creditable exhibition of the Mexican and Guatemalan fruits was made by some of the members. Linda fruits weighing as much as 3 pounds were exhibited. The exhibit was in charge of Mr. Yaggy and Dr. Keller.

At the conclusion of the program President Sallmon expressed the appreciation of the Association to Mr. Yaggy and his committee for arrangements for the meeting; to Miss Sexton for her kindness in furnishing the beautiful decorations; to Dr. and Mrs. Keller for their efforts in securing an ample supply of ripe fruit for the dinner; to the management of the Belvedere for the generous assistance which made our meeting a success; and to the local Chamber of Commerce for courteous invitations for entertainment.

The program being finished, President Sallmon declared the meeting adjourned.

W. L. HARDIN, Secretary.

OPENING ADDRESS

PRESIDENT WM. H. SALLMON, CHULA VISTA, CALIF.

Ladies and Gentlemen:

Let me first express the pleasure we feel in meeting in Santa Barbara, and under the roof of this famous old hotel. It is peculiarly fitting that we should meet in this section of the "Golden State," where so many experiments in the growing of avocados were tried, where several varieties have originated, and where so many successes in the culture of the fruit have been attained. Here some of the earliest plantings in the state were made. In 1871, the late Judge R. B. Ord brought three avocado seedlings from Mexico, two of which grew to be fine big trees, bearing good fruit. Here the first orchard of avocados planted in California was started by the late Kinton Stevens in Montecito in 1895, and here the late Joseph Sexton nurtured at his home in Goleta over ninety varieties of avocado trees representing types from Mexico, Guatemala, Hawaii, Florida and California, with the object of discovering the varieties best adapted to the conditions in this section. It is pleasurable and profitable to visit the place of beginnings and the pleasure and profit we derived from the dinner and lecture last evening are foretastes of what we expect from this meeting in Santa Barbara.

It has been the custom of the California Avocado Association to hold two meetings a year. The annual meeting at which business is transacted, directors elected, reports of secretary, treasurer and committees received, the annual address of the president delivered, and a get-together dinner with brief prepared speeches enjoyed has, by common consent, been held in Los Angeles or Pasadena in the spring. The semi-annual meeting with a set program but with no business transacted, no reports of officers or committees except one occasionally of very general interest like the report of the committee on varieties to be presented at this meeting, a dinner without speeches and an informal address by the president, is held in the fall. Such meetings, like this at Santa Barbara, have been held also at San Diego and Riverside. We are a young organization and it has been felt that the holding of two meetings a year helps to stimulate and maintain interest. Moreover, the exhibit of fruit which is such an attractive feature of our gatherings,

gives an opportunity for the thin-skinned and the thick-skinned growers to show their wares at the respective seasons of ripening.

I wish to submit for your consideration a change in the order of things. The old order has served its purpose well. The two yearly meetings have brought us together in a fraternal way and we have threshed out our problems pretty thoroughly. Our annual reports are widely considered as compendiums on the history and culture of the avocado and we are dubbed as the most enthusiastic and progressive bunch of fruit growers in the state. But, ladies and gentlemen, I must reveal to you the secret that the holding of two meetings a year with set subjects and speeches is becoming a burden. We have studied and discussed the entire range of operations from seed-time to harvest, and all that we know about the business is in print. There is very little additional information to add each six months and the selection of subjects and speakers to make two programs a year is becoming increasingly difficult. I am giving you the experience of the leaders who are on the inside. They are using their time and spending their money freely to make this industry a success, but they realize that the range of discussion and the constituency upon which we have to draw are necessarily limited. If the fruit could be grown more widely the situation would be different, but since it is apparent that avocados in this country can be produced in quantities in small and favored sections of California and Florida only we must face the facts as they are and as they are likely to remain.

I wish to offer two suggestions, and the first is that the California Avocado Association ally itself with the State Fruit Growers and meet with that body in the fall. It seems to me that some of our difficulties would be solved by this move, and that there is much to gain and nothing to lose by such an alliance. This young organization would import strength and impart enthusiasm in that old body which holds its fifty-second annual meeting next month. These fruit growers represent all the horticultural interests of the state, and bring together in their annual meetings a large audience of growers and farmers, nurserymen and scientists, contact with whom would be most advantageous for us. There could be no more opportune field for our propaganda—using that word in its best and not its degraded meaning. Their published "Proceedings" shows that they give attention to most of the subjects which concern us like the soil and its cultivation, planting, budding, advertising, packing, shipping and control of diseases and pests. We could attend such of their sessions as interest us and also hold an open meeting with two or three addresses devoted to the avocado. In their proceedings for 1912 and 1914 I find that such addresses were given by two of our charter members.

My second suggestion is that we interest ourselves in other semi-tropical fruits and vegetables, that we study them for the pleasure to be derived and the possible profit and also that we may add to the food production of the country. We have too many eggs in one basket in Southern California and they are chiefly oranges and lemons. In my district it is largely lemons, though it was demonstrated before the freeze that we could also grow good oranges and grape fruit. But there is also the loquat, the cherimoya and the chayote, the passion fruit, the mango and the feijoa, the date, the guava and the lime, some of which are already in a fair way to become commercially profitable. We could enlarge the range of our interest by dealing with these and other semi-tropicals at the fall meeting, while reserving the spring meeting exclusively for the avocado.

I would suggest that we be represented at the next convention of state fruit growers, and that these ideas be studied by the directors, and, if approved by them that they be presented to the members of our Association for discussion and action.

TOP-WORKING OLD AVOCADO TREES

DR. WILL R. MANNING, FILLMORE, CALIF.

Mr. President, Ladies and Gentlemen:

Just why the intensely interesting and highly important subject of "top-working" the avocado tree has occupied so little space in our literature, I am at a loss to understand. Page after page has been devoted to the care of nursery stock, budding, planting, protecting, irrigating, pruning, fertilizing, marketing, chemical contents, food values, etc., etc., till practically every branch of the industry has been thoroughly covered, but so far as I am able to ascertain, little or nothing of an authentic nature has ever been written regarding "top-working."

To be sure, until recently we were not much interested in this subject, for the very good reason that with the exception of an occasional seedling, we had no trees to top-work, or at least that is what we thought. Later, however, most of us began to realize that our early plantings had not, and never would, live up to our expectations. In the first mad rush many of us paid fabulous prices for sickly specimens of delicate non-productive varieties. Our idea was to get into the game, and that quickly. We were imbued with the spirit of "do it now." We wanted avocado trees, and anything so-called was all right with us. I actually paid \$15.00 for a four year old tree, which had never been out of the coal oil can. Fortunately for all concerned, most of these trees are now dead.

Many of us next turned our attention to the hardy Mexican variety, and were indeed fortunate in so doing for they have lived and thrived and can with certainty and in an incredibly short space of time be converted into well-formed bearing trees of whatever variety our more mature judgment may dictate.

About a year ago I became convinced that most of the trees in my orchard would not do, so I promptly began casting about for information regarding the best method of working them over. With this object in view I visited a number of my friends who are well up on all things pertaining to the avocado, and was astounded to learn that even the best informed of them could tell me nothing definite regarding "top-working."

One thought that the best plan was to bud into the old wood. Another advised cutting the tree back and budding into the new growth. While yet another believed that grafting would prove most satisfactory but was not sure as to just when or how it should be done. So, as time was pressing, I decided to abandon my quest and do a little experimenting.

Not wishing to have all my eggs in one basket, I made up my mind to give all three methods a trial, which I did. Cutting my trees well back I placed grafts in the main stumps, buds in the old wood of the large limbs, and also later in the new shoots. In this manner several hundred grafts, and as many buds were used. A few weeks of observation was sufficient to convince me that there was but one method of "top-working" worth mentioning, and subsequent developments have but served to strengthen that conviction.

Some of the buds did fairly well, but practically every graft failure was directly traceable to ignorance or carelessness on my part. The growth attained by some of them was almost unbelievable. At the end of six months several of them calipered as much as two inches, and a number had grown to the height of six feet. A few trees carrying six or seven grafts presented a bearing surface equal in extent to that of the average tree three or four years of age.

Now I have arrived at the point where possibly I should have started.

"TOP-WORKING" THE OLD AVOCADO TREE BY THE GRAFTING METHOD

The outfit required for grafting is not extensive. A wedge made of some hard wood (orange or lemon will do nicely) eight to ten inches in length and one inch in diameter, a pruning saw, butcher's cleaver, a hammer, a pot of grafting wax, some contrivance for keeping the wax warm (I use a lamp in a coal oil can), a paint brush and a roll of budding cloth complete the list.

The selection of the graft wood is most important. It should be hard and well matured, but not too large, and taken from what is known as the "second growth." The buds on this wood should be plump and well-formed, but not too far advanced. Soft pulpy wood with feathery buds is most undesirable. As an illustration of the importance of wood selection, I will state that my first efforts were crowned with dismal failure. Out of fourteen grafts most carefully applied, not one was living at the end of two weeks (they were all from first growth wood). I cut these same trees back eight inches and applied second growth wood without the loss of a single graft.

The ideal tree for grafting is one which is branched near the ground, presenting a well formed crown, composed of three or four limbs of about equal size. Each of these limbs should receive two grafts, one of which may be later removed if so desired. Such a tree will produce a marvelous head in a very short space of time. Many trees, however, grow straight and tall with few or no large branches near the ground. These trees are sawed off at a height of about four feet and four grafts are inserted. Later two of these should be cut away if they interfere with the growth of the others.

There are doubtless numerous variations in the technic of grafting. However, the following has proven entirely satisfactory in my hands. Having selected a point at which your final cut is to be made, go a foot or two above and saw off the heavy top. This is a precautionary method to prevent splitting. The top being removed, cut squarely across at right angles to the long axis of the limb at your selected point. Next with a sharp knife smooth off the face of the stump, removing the velvety surface left by the saw. Then place the cleaver across the middle of the stump and split it with several sharp strokes from the hammer, remove the cleaver and insert the wedge, pounding it in until the crack across the face of the stump is at least twice the width of the graft to be used. Unless the stump is split for a considerable distance the pressure on the grafts will be too great when the wedge is removed. You are now ready to prepare your graft.

Select your graft stick, as a rule using the heavier wood in the larger stumps. Cut the lower end of the grafts in such a manner as to form a wedge approximately one inch in length. The sloping sides of this wedge must be perfectly flat and smooth. Correct any concavities or convexities which may exist. The length of the graft is unimportant, but it should possess two or three good healthy buds. The top of the graft is cut squarely across, leaving a flat smooth surface. The grafts now being prepared, insert the wedged ends, one on either side of the split in the surface of the stump, carefully remove the wedge until the grafts are slightly pinched but easily movable. Now adjust the grafts in such a manner that the cambium of the outer side of the graft is in contact with the cambium of the stump. This being done remove the wedge and the pressure will hold the grafts firmly in place.

A crack of considerable width now remains across the face of the stump. This is filled in with paper, cloth, avocado leaves, or anything else which may be at hand, the idea being to prevent the hot wax from running away when later it is applied. Next apply a bandage of budding cloth about one inch wide from the

top of the stump to the lower limit of the split in its sides. Now with a paint brush apply a generous coating of hot wax to the face of the stump, making sure that the outer edges and points of contact between the grafts and stump are well covered. Owing to the thickness of the bark on the stump the grafts will set slightly in, leaving a space between the bandage and the graft, this space is filled with a plug of soft wax and painted over with hot wax. It is well to reinforce the bandage where it covers the split with a coat of the wax. Cover the upper ends of the graft with a thick coat of paint, it is more adhesive than the wax, which is sometimes used. Protect the grafts from the sun by wrapping newspaper about the ends of the stumps. If possible always leave a few branches on the grafted tree for two months to aid in carrying on the circulation. The trunk of the tree and the large branches are protected from the sun-burn by means of the application of several coats of white-wash.

The buds will start to swell almost immediately, and from this point on require constant attention. No fixed rule can be given to govern either the number of grafts to be permitted to develop on each limb or the number of buds permitted to develop on each graft. Each tree presents a case in itself, and no two require the same treatment. There is one point which I cannot emphasize too strongly, that is, the importance of supporting each graft. Their rapid growth and consequent weight renders them extremely susceptible to violence of any kind. I have lost no less than twenty-five of my choicest grafts through inadequate support.

Just how late in the spring grafting can be successfully done I am unable to state. However, I can say that my April grafts have proven quite as satisfactory as those of February.

GROWING AVOCADOS FROM SLIPS

S. W. JAMIESON, BURBANK, CALIF.

Mr. President, Ladies and Gentlemen:

My information on the subject of Avocado cuttings is all second hand, as I have never made any myself. It is a matter of considerable interest to know that it can be done, whether it is ever commercially successful or not. My attention was first brought to the matter through hearing of some experiments in that line made by Mr. Corcoran, Horticultural Instructor at the Manual Arts High School, Los Angeles, and the following information was received through him:

The cutting should be made when the tree is as inactive as possible and should be from young, firm wood. Care should be taken that the knife is very sharp and that the cut is made through a node, or joint. It may help to slit the bark slightly at the lower end so as to break it and aid in callousing. Ether seems to aid the process but they will root without it. When ether is used the upper part of the cutting is protected by paraffin, or by inserting in sand and the lower part exposed for eight hours to the action of one cubic centimeter of commercial ether to the cubic foot, covering the cuttings with a bell glass or similar contrivance during the process. This acts on the oils and starches, changing them to sugar, making them more active and aiding absorption or sap current.

Prof. J. C. Whitten of the College of Agriculture is going to work on this during the coming season, and his results will be available within a year. A letter addressed to him at Berkeley will bring a response as to his methods and success. Under good lath house conditions with clean sand and starting about the last of February, there should be little difficulty in rooting at least 50 per cent of the cuttings made.

SOME THINGS WE HAVE LEARNED

WM. A. SPINKS, DUARTE, CALIF.

Mr. President, Ladies and Gentlemen:

I believe the entire present day method of propagating Avocado trees to be unscientific and should be abandoned, especially in making orchards. The seed should be planted where the tree is to grow—the seedling budded where it stands and never moved.

In my humble judgment, this is the only way to obtain a one hundred percent. tree. I do not assert that very good trees may not be had by the old method of growing in nursery rows, balling and moving to the permanent location, but I do say that in no case can a tree be just as good as when left in its original location, while in many instances it is not nearly as good. The plan is hardly practicable for those needing only a few trees for home use, there being, as a rule, too many difficulties in the way of getting the work done. I see nothing in the way of its adoption by orchardists.

The Avocado when left to take its natural course will put down a deep tap root. In the balling process this tap root is almost invariably cut, from one to two feet below the surface and when it starts growing again does not take its original vertical course but puts out a number of lateral branches, none of which ever attain much depth. The result is a shallow and unnatural root system—the disadvantages of which are too numerous to mention here in detail. This much should be clear, however, to anyone who believes at all in Nature's wisdom. A tree which wants to make a deep tap root cannot attain its full strength and vigor if prevented in any way from doing so. The deep tap root gets the lower moisture, consequently the tree requires less irrigation and cannot be tipped over by wind.

A serious objection to the practice of balling and moving trees is that they are often placed in soil entirely different to that from which they were taken. Should the soil in which the tree is placed be of more porous nature than the ball of dirt surrounding the roots, great care must be exercised in irrigating to prevent the water from draining off before the small amount of heavier soil containing the roots has been saturated. This rule applies especially when the trees have just been moved and before the roots have had time to grow out into the new soil. Many trees have been lost in this way, I am sure, with the grower unable to account for their failure. With such conditions it would probably be better to move the trees "open root," thus eliminating all of the heavy soil. In moving either large or small trees "open root," first cut them back, then do not move at once but wait until the new growth starts. Keep the roots moist by puddling or some other means until the tree is safely planted and watered.

Let me here digress enough to say that Avocado trees planted in heavy soils where water does not readily drain off may easily be over watered, while it is practically impossible to over water them in light, porous soil.

Another objection to the practice of growing trees in nurseries and shipping to innumerable places is the danger of spreading pests and diseases. This would be entirely eliminated by the plan here suggested. But you say "a seed may not sprout and I should have many blanks in my orchard." I suggest that several seeds be planted in a small circle around the location for each tree. It is not likely that they would all fail to grow. Bud all of the resultant seedlings, finally eliminating all but the best one. Avocado seeds sometimes take several months to sprout. In soils which bake easily a little sand mixed in where the seeds are planted is an advantage. Watering and caring for seeds thus planted in orchard

form and widely separated would doubtless entail more trouble and expense than if they were in nursery rows, but this would be more than offset by doing away with the necessity of balling and shipping. On the whole, orchards could be had at less cost and with far better trees.

It would be a distinct economy—and in the end economy benefits all concerned—to send an industry happily and prosperously along, eliminate waste, stop up the leaks. The packers claim to make use of every part of the hog but the grunt, and see where they have arrived! One of the principal aims of this association should be the elimination of waste. This suggestion probably will not be relished by the nurserymen, but in the end I do not think it will hurt them. At present they are forever running the risk of propagating trees they cannot sell, thus imposing on the industry as a whole a certain amount of dead loss, which must be borne by someone somehow, and constituting, I believe, an unnecessary overhead expense.

Let the nurseryman contract to make orchards for people on the new plan and he can figure his profits in advance, also you may be sure he will stick to strong healthy varieties which he knows will grow.

This matter of sturdy trees brings us again to a subject on which I have talked more or less insistently for some years. In selecting varieties for commercial orchards, the tree is more important than the fruit. Its strength, vigor, rapidity of growth, and resistance to heat and cold should be considered before the quality of the fruit it bears. Why? Because if you have a strong tree and do not like the fruit, you may change it to any desired variety in two years by top-working, whereas, if you have selected a sickly variety because it bears the kind of fruit you want, you have only disappointment ahead of you. Happily, there is no longer any necessity for taking chances, as we now have sturdy varieties producing also very fine fruit. One of the best examples of this combination of good points is the Fuerte, a wonderfully strong tree and fruit of superfine quality. You can make no mistake in planting the Fuerte.

Plant strong trees, and if you are planting to make money, not too many kinds. There are, I believe, one hundred and thirty or more named varieties. Some of our friends, not knowing for certain which to select, have "played safe" and planted them all. That is not an orchard; it is a horticultural museum, and has no commercial value. Not much safety about that. We must make decisions. Playing too safe is the unsafest way of all policies. Consumers will eventually buy largely by brand, dealers the same way, demanding also uniformity of pack. Odds and ends will be hard to sell. One variety in an orchard is best, but if you must have two, start one in orchard form first, then interset the other in the middle of the squares. If you live long enough to see them crowd, take out the poorer one, which you may do, and still leave the other in perfect orchard form.

Some plant several varieties so as to have fruit the year round. Why does an orchardist want fruit the year round? If he can get the same amount of money for his crop and get through harvesting it in a month or two, I should think he would want to do so and take a vacation; take the folks to the beach! We don't want to work all the time. The tendency of the times in industry is towards more and more rest. The owner of a grove gets no extra pay for overtime. A single variety in a grove brings less care and more profit. "Put all of your eggs in one basket," said Andrew Carnegie, "and then watch the basket." No one was more competent than he to formulate a business policy or watch a basket.

Judging varieties by the fruit alone without regard to the tree has been the cause of more loss and disappointment than any other thing in this business. Many

of you, for example, remember the Murrieta varieties—the green and purple, the latter now being called Colorado. Ten years ago they were propagated and planted by the hundreds, and I doubt that one of the trees is living today, except some that were top worked. The parent trees were healthy enough, although growing under rather adverse conditions, and up to the present day we have no better fruits than the Murrieta and Colorado. For some unknown reason they could not be made to grow and keep growing by any means known to horticultural science. The buds started all right in many cases, but after a year or two at most of miserable existence, finally died, having survived just long enough to fool both nurseryman and orchardist.

And here is the point I am trying to make clear—many varieties have this tendency in greater or lesser degree, while some others have it not at all; hence when a new fruit has been discovered equal or superior to those we already have, it does not follow necessarily that we have a valuable new variety; it has still to be tested as a tree by budding. The tree it grows on may look strong and healthy, but that proves nothing at all. All seedling trees grow strong and healthy, with favorable conditions, so far as I know, but a bud taken from a strong tree and transplanted to another tree may make a droopy, sickly growth, or may not grow at all. We do not know why. There seems to be a lack of affinity between many of the varieties. An interesting theory is that root system and bud are not matched as to rapidity of growth, it being a known fact that some varieties grow more rapidly than others. Some have thought that thick-skins should be budded on thick-skin roots and thin-skins on thin-skin roots, the idea being that the two families are too distantly related to get along well together. At present thin-skin root stock is used almost exclusively by nurserymen because of its hardness, whereas the buds are nearly all taken from the large fruiting, thick-skin varieties.

I doubt that either of these theories correctly and completely explains the phenomenon of poor bud growth, but each furnishes an interesting working hypothesis for the experimenter.

We have noted a most interesting thing in our own top-worked orchard of some two hundred ten year old trees, formerly Harmans, which were budded three years ago to a strong growing variety and nearly all of which now have very satisfactory new tops. About ten of these trees were first budded to the Murrieta variety, and half of that number now have rather poor tops of that kind. In the others we believed the buds to be all dead, so worked the trees over again, this time to the strong growing kind of which the main orchard is composed. It happened that in each of three or four of these trees a single Murrieta bud was still living; and, strange to say, these braced up and came right along with the rest of the top. They seemed to need the help of the strong growing variety to pull them along and are today the only satisfactory Murrieta buds we have on the place. I should have expected it to work exactly the opposite way—that is to say, I should have expected the strong buds to crowd the weak ones out, all of which proves to be a fact that which has long been suspected, to-wit: my judgment in such matters is not infallible.

I am convinced that much of the limber, droopy growth noted in many varieties is due to root cutting when the young trees are balled and moved. I have an orchard of some two hundred Lindas which were moved into place three years ago, and some fifty others of the same age which were not moved but left to grow where they were originally budded. The ones not moved have made satisfactory growth, standing upright and strong while the ones moved into the orchard were very unsatisfactory, notwithstanding we took very large balls of dirt with each of

them. After the big wind of last November they were all lying prone on the ground, the trunks being too weak to support the tops. In the judgment of others as well as myself, the only sensible thing was to grub them all out, but this seemed a hard and drastic thing to do, so we finally decided to give them one more chance by a resort to severe pruning. We had noted when limbs had been broken or cut off, that the new growth was always straighter and stronger than the original. Our hope was that by making practically all the growth new we could strengthen and straighten the trees and help them to overcome the droopy, vinelike tendency so far shown. The plan worked even better than hoped for. Today they are healthy looking, the trunks have become strong, while the trees themselves, I am sure, are larger than they would have been had they not been cut back. In our pruning we left little more than the bare trunks; just a small amount of foliage here and there to keep the trees from dying.

The question of pruning has been one that the Avocado grower has approached timidly. With no experience or recognized practice to guide him he has hesitated for fear of ruining his trees, though nearly all, and especially the budded trees, have needed it badly. The one variety, in my experience, which shapes itself almost perfectly without pruning, is the Taft. I think this question has been quite satisfactorily solved, however, by Mr. P. D. Barnhart. His trees at the Danziger place, Beverly Hills, are the most perfectly shaped of any I have seen. His rule, briefly stated, is to keep the tree down, never allowing it to get taller than it is wide.

There is much more to say about pruning for which I have neither space nor qualification to speak. A paper on this subject by Mr. Barnhart would be very valuable to Avocado growers.

As a final word to amateur growers, let me warn against killing your trees with kindness. Too much water in heavy soils and over-fertilization have caused the loss of many trees. The Avocado does not need so much water, according to size, as a citrus tree, and will never tolerate standing with its roots in soggy, sour soil. Do not fertilize very young trees. They do not need it, and are oftener injured or killed in this way than benefitted. Except in the poorest of soils, fruit trees in general do not require fertilization until they are bearing.

THE INFLUENCE OF THE CHARACTER OF THE STOCK ON TREE GROWTH IN CITRUS PROPAGATION

HERBERT J. WEBBER, HARTSVILLE, SOUTH CAROLINA

Mr. President, Ladies and Gentlemen:

Why should a paper on a purely citrus subject be presented before the California Avocado Association? Because it is an opportune time for avocado growers to take stock of the subject to be presented and secondarily, because many of you are interested also in citrus culture. As the subject is presented I think you will discover that it is of as much interest to avocado growers as to citrus growers. With this explanation of the subject, I will proceed with the discussion.

Why do some trees in a citrus grove remain dwarfs, or grow slowly and produce few fruits while others grow well and are very fruitful? Why are some groves uniformly composed of good trees while others are composed of trees of various sizes and degrees of fruitfulness. Mr. A. D. Shamel of the U. S. Department of Agriculture has emphasized the relation of the character of the buds used in propagation to this variability in orchards and has rightly urged the importance



Fig. 1.—Marsh Seedless grapefruit. Average-sized trees chosen from test rows of large, medium and small nursery trees; large on left, medium in center, small on right. Planted in orchard June, 1917, and photographed May, 1919.



Fig. 2.—Sour orange (C. E. S. No. 628). A good, typical type with vigorous and excellent foliage and branching characters. Selected as a good stock type.

Fig. 3.—Sour orange (C. E. S. No. 625). A type of medium size, also differing from others in foliage and branching characteristics.

Fig. 4.—Sour orange C. E. S. No. 619). A slow-growing dwarf type.



of choosing buds for propagation from uniformly highly yielding trees of good standard type. Is this all of the story or are other factors involved, which we should know about and guard against in growing citrus trees?

It is a well known fact that nursery trees as they are normally grown, when two years old and ready for sale, exhibit great diversity in size, the trunks frequently ranging from $\frac{3}{8}$ inch to $1\frac{1}{2}$ inches in diameter. Does this variation in size of trees of the same age mean anything, or is it purely accidental? All of these trees are ordinarily sold and planted. Probably these differences in size are due to the same or similar causes as those responsible for the differences in size of bearing orchard trees.

A nursery grown at the Citrus Experiment Station for experimental purposes was planned with the idea of producing as uniform trees as possible. The sweet seedling stock used was thus selected when it was planted in the nursery, many of the small trees being discarded. Through the kindness of Mr. Shamel, the buds used for propagation were taken from some of his best record trees of standard type in order to further insure uniformity. Valencia and Washington Navel oranges, Marsh Seedless grapefruit and Eureka lemon were the varieties grown. When this nursery was two years old and ready for orchard planting the trees were found to show the same variations in size of buds that have been referred to as being universally present in ordinary nurseries. Had buds been taken indiscriminately from ordinary trees this variation would have been passed by as normal. As it was, this fact led to a test of the different sizes of trees to determine, if possible, whether they were of any importance in growing an orchard. Eighteen large, eighteen small and eighteen intermediate sized buds of each variety were selected and planted in comparison rows in the variety orchard at the Citrus Experiment Station, Riverside, California. These trees were all dug "bare root" to see that the roots were normal and not injured or diseased. All were normal and thoroughly healthy so far as could be determined. They were planted in the orchard in June, 1917. The severe heat coupled with "bare root" planting injured so many of the Eureka lemons that this variety was eliminated from the experiment. The Navels, Valencias and Marsh Seedless grapefruit stood the transplanting very well and are still growing.

These trees have now been in the orchard $2\frac{1}{2}$ years and are $4\frac{1}{2}$ year old buds. They still retain the same comparative difference in size just as markedly as when they were transferred from the nursery.

To get some indication of the comparative average size of the tops of the different groups, the top diameter of each tree was measured east and west, north and south and the height from the lowest branch to the top of the foliage. These measurements for each tree were multiplied together to give the volume of the cube that would enclose the top. The averages of these figures for each group in each variety are given in the following table:

	LARGE	INTERMEDIATE	SMALL
Navels.....	54,174	20,185	12,541
Valencias.....	29,003	15,606	12,953
Grapefruit.....	26,343	15,827	10,642

While admittedly such figures are not exact measures of the top volume, they are believed to represent fairly accurately the comparative sizes of the trees in each group.

To what factors could this variation be due, and is it of any importance in citrus propagation? A difference in the soil or in the nutrition available might

cause variation in size, but this cannot be the main cause of the variation in size of these trees as they showed the difference in the nursery and continue to show it 2½ years after transplanting into the orchard. In the orchard they are planted close together on uniform soil and are treated alike so the difference cannot be attributed to local soil condition or nutrition.

Is the difference due to the character of the bud union? The buds seem to have healed nicely in all trees used and exhibit no characters that would indicate a difference here.

Is it due to the roots having been injured thus resulting in dwarfing the tree? The roots were all examined when the trees were transplanted and all were found to be healthy and uninjured. Any injury or disease contracted since the trees were transplanted could not be limited to the small tree rows only.

Is it due to the kinds of buds used? All that can be said regarding this is that the buds were carefully selected from trees of known record and standard type. It does not seem that the difference is to be explained in this way although this possibility cannot be entirely eliminated.

The only other factor that is likely to be the cause of the variation is the influence of the stocks used. The sweet orange stock used was merely ordinary sweet orange seedlings grown from unselected seed, the only extra precaution taken being merely to discard the small seedlings when transplanting from the seed bed. About fifteen percent. of the total number of seedlings were discarded at that time. The universal custom pursued at present is to use either sweet, sour, grapefruit, lemon or trifoliate orange stock without reference to any particular kind within these great groups. Are the variations within the ordinary lots of sweet and sour orange seedlings sufficiently great to be assumed to account for these variations in size of nursery trees? Fortunately some evidence has been secured bearing on this point.

In 1915 the writer, with the help of Mr. W. M. Mertz and Mr. E. E. Thomas, made an examination of one sour orange nursery and selected sixteen seedlings that appeared to show different characters. At the same time in the same nursery four different types were selected in a bunch of sweet seedlings. A more detailed examination would doubtless have revealed many more types but the only object in view at that time was to add "freaks" to the variety orchard. Buds were cut from each of these seedlings and two sour orange stocks were budded with each type. The trees from these buds are now 4½ years old from the bud and have been set in the variety orchard for 2½ years. All of the types selected present marked differences in size, foliage, character of branching and the like. The good vigorous types in the case of the sour orange selections are five times, or more, larger than the slow growing dwarf types. Two trees out of sixteen of the sour orange types selected have lost the typical aroma of the sour orange, so far as the leaves are concerned. The four types of the sweet orange also differ in similar way in size and foliage characters.

The great extent of this range of variation within the different species is shown equally as well by the large number and range of the named varieties that are grown.

In sweet orange and sour orange seedlings, usually or at least frequently, grown from seed of unknown origin, and coming from different trees, we are not dealing with a homogeneous lot but with lots in which every individual differs from every other individual and yet our policy has uniformly been to use all; good and bad alike, for propagation. Is it any wonder under these conditions that our trees, though grown from the best selected buds should be variable in the groves?

The Eureka lemon on a trifoliolate stock is very markedly dwarfed while Valencias grow to good sized trees. The Florida rough lemon is usually a good stock while the Chinese lemon is commonly recognized as a poor stock. Different reactions on the bud caused by the influence of different stocks are well known to exist. When, therefore, such marked differences are found to exist in our sour and sweet orange seedlings that we are using as stocks, is it any wonder that the budded trees in the nursery, even when selected buds are used, should grow differently and produce large and small trees, and that these differences should continue to exist when the same trees are grown in the orchard?

The evidence now available very strongly points to the conclusion that the differences in size of nursery trees, such as those taken for the experiment outlined, are mainly to be attributed to the different nature of the seedling stocks used. If this is true, and it is entirely in line with the evidence as well as with common sense and judgment, it immediately becomes an element of fundamental importance in citrus propagation.

I would be remiss in caution and duty if I did not call your attention to the fact that one very important link in the chain of evidence is yet lacking, that is, the growing of good buds on known stocks of these various types to prove that certain ones give better growth than others. This evidence, however, is partially supplied by our known experience of the reaction of buds on different stock such as referred to above.

Will the small trees continue to remain small? Certainly the evidence thus far indicates that this is very likely. It's a good bet that they will. Dr. Reed of the Citrus Experiment Station carried out a series of experiments with a considerable number of sunflower plants that has a bearing on this phase of the problem. In this group of sunflowers, exact measurements of height were made of each plant every week from the time it was a few inches high until it reached maturity. The analysis of the data of growth obtained showed a well marked tendency of the plants to retain their same relative rank as to size throughout the period of growth. Plants which were small at maturity were generally small in the beginning, and those which were large at maturity had a well marked superiority from the start. The evidence indicated that height and vigor of growth were determined not by chance but by some definite inherent factor in the plant itself. The same is doubtless true with citrus seedlings of the various species, such as those used for stocks, and if the cause of the different sized nursery trees is to be attributed primarily to the influence of the stocks as seems probable, then it is also probable that the difference is due to causes inherent in the different stocks and that the same relative rate of growth and size will be maintained in the majority of the plants.

While the evidence is yet incomplete, we are probably justified from what evidence we have, in speculating somewhat as to what this means in our fruit industries. Frequently, almost every tree in an orchard will be a fine good grower and fruiter, giving a uniform orchard. Again, an orchard equally well handled may be very ununiform, having some good trees, some poor ones and some of intermediate character. This difference could be accounted for by assuming that the good orchard chanced to be from trees grown on stock that happened to come from seeds of good stock trees, or that they had been taken from a nursery where in filling the order of size only the large trees had been dug, which would be the ones naturally of good vigorous stocks. The remaining slower growing trees from such a nursery would ultimately reach the required size and be sold and planted in another orchard which would likely give an uneven orchard with good and bad trees.

Some growers will be inclined at first to think that their experience is contrary to this and that the small tree is more likely to be fruitful, while the largest trees are likely to spend their energy in vegetative growth. They must remember that this experience was gained before buds of selected type were used. Mr. Shamel has demonstrated that some types of our varieties tend to produce rapid growth and little fruit while others produce good growth and are fruitful. The results the writer is explaining, however, were obtained with the use of buds taken from the best fruiting types and it is not likely that this type will be changed materially by the stock other than in size of growth.

If the results of these experiments are correctly interpreted by the writer, it means that our nursery methods in citrus propagation must be materially changed.

(1) We must no longer grow merely sour stock or sweet stock and the like. The process must be carried farther and good stock varieties of sour orange and sweet orange must be discovered and named as stock varieties, and every nurseryman should then use seeds from these varieties known to produce good stocks.

(2) Good policy will doubtless dictate that all small seedlings be discarded when transplanting from the seed bed into the nursery.

(3) In budding a nursery no inferior seedlings found in the nursery should be budded. Doubtless hereafter we should carefully inspect the seedlings just before budding and cut out all inferior ones to save the expense of budding them.

(4) When the budded trees reach the age for transplanting into the permanent orchard only the good, vigorous, growing ones should be used.

The writer assumes that naturally now only buds from trees of known good record and of standard type will be used in propagation. This is already recognized as the only correct and safe policy.

In a long time crop, like citrus fruits, too much care cannot be used in the beginning to insure that the trees planted are worthy of the effort and expense. How much this will mean in the improvement of our citrus orchards cannot now be foretold. That a change in our nursery methods has become necessary I think few will be inclined to question.

This is the first time this material has been presented before a public audience. I was anxious to place it before avocado growers because the principle doubtless applies equally well to the avocado and to the other fruits that are budded and grafted. The avocado industry is just starting. The great avocado groves of the future are yet to be planted. The trees grow large and not many are required to plant an acre. These trees should all be from selected buds and on selected stocks. I have no doubt but that the stock is just as important an element in success as the bud. No factor can be neglected. You must have good varieties, good buds, good stocks, good soil, good culture, good packing to secure good money. It's a good industry.

ATLIXCO

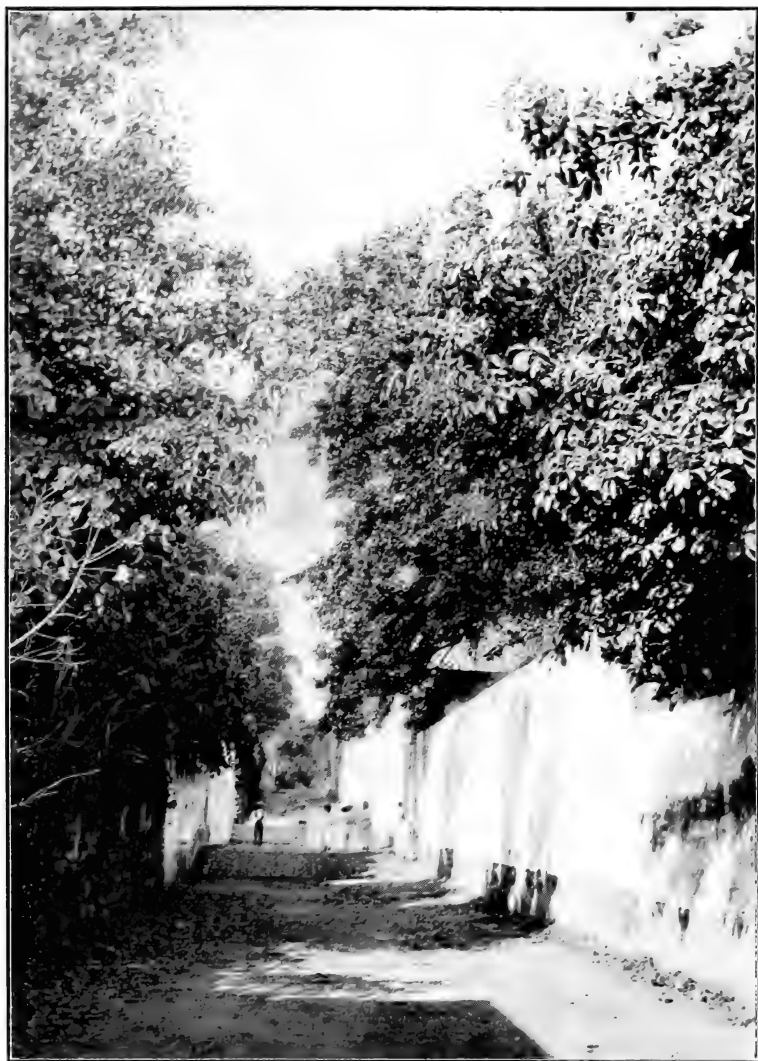
WILSON POPENOE,

Agricultural Explorer, U. S. Department of Agriculture*

Mr. President, Ladies and Gentlemen:

"It was cold this morning when I arose in Puebla"—thus runs the entry in my Field Journal under date of December 18, 1918—"and as I came down

*The investigations of which this paper is a report were conducted on behalf of the College of Agriculture, University of California. For assistance in planning and carrying out the trip to Atlitxco I am greatly indebted to Rev. F. F. Wolfe of the Methodist Mission in Puebla.



A STREET THROUGH THE AVOCADO GROVES

Along this picturesque roadway are several of the walled orchards from which were obtained the fine Atlixcan avocados now cultivated in California and Florida.



the street toward the railway station I noticed frost upon the roofs of the houses. An overcoat and gloves, which had for months lain untouched in my trunk in Veracruz, while I was in the hot lowlands, now felt very grateful. It was just such a morning as we often experience in California at this season of the year.

"The train started just as the sun was rising over the distant hills, and we were soon rolling across the broad, level floor of the valley of Puebla. The village of Cholula, with its immense pyramid built by the ancients, was reached after half an hour. At the time of the Conquest this was an important city, with commerce which extended as far south as Guatemala. Because of the religious institutions which existed here, Cholula has been called the Mecca of the ancient Mexicans. Nearby Atlixco, it seems to me, may well be termed the Mecca of California avocado growers. Because of the important part which it has played in the early development of our avocado industry it must always remain to us an historic spot, and it will, I believe, be visited in future years by many Californians.

"We left Cholula, and traveled across a fertile plain directly toward the volcano Popocatepetl, whose snow-covered summit, towering ten thousand feet above us, glistened in the morning sun. On our right, stretching away to the hills, were patches of scrub and other patches of unbroken grass land. On our left were endless cornfields, in which the crop had been harvested and the fodder cut and shocked.

"Here and there we passed a house or two, with fruit trees scattered about—apricots now dropping their leaves and peaches coming into bloom. Then we came alongside the *malpais* or 'bad lands,' the extreme limit, it is said, of the last lava flow from Popocatepetl. The dull gray rock is heaped up thirty feet or more above the surface of the land, and its jagged surface furnishes innumerable hiding places to Zapatistas, who are wont to fire from this stronghold upon passing trains.

"Up to this point we had traveled at the level of Puebla, 7,100 feet. Once past the *malpais* we began to descend. It was not a rapid drop, but rather an easy descent across the sloping plain and alongside a barranca leading through the Tentzo hills which separate the valleys of Atlixco and Puebla.

"And as we began to descend I had my first glimpse of the valley of Atlixco, and could fix the situation of the town itself by the *cerro de San Miguel*, a conical hill, beautifully symmetrical and of considerable height, which rises abruptly from the plain.

"I never go into a new region which holds something of interest without carrying with me certain preconceived ideas of its appearance. And almost invariably these ideas turn out to be erroneous. If I might have seen a few photographs of the valley of Atlixco before I came here I would have had no occasion to be disillusioned—*desengañado*, as the Spaniards say—in the rude manner which befell me. I had pictured a small mountain valley, whose slopes were covered with the pines and oaks characteristic of this elevation, and a town of picturesque houses nestling among roses and fruit trees. Imagine my surprise, therefore, as we passed around the western end of the Tentzo and I saw spread out before me, stretching away into the dim and hazy distance, a broad, level plain, intensively cultivated, almost devoid of trees, and broken here and there by a series of low, rolling hills, as brown and barren as those of Southern California in September.

"As we came alongside the station and climbed off the train, I noticed that the town was not hidden from view by roses and fruit trees. At first I was disappointed, and then I began to wonder where I would find the orchards which I knew must exist close by. Here and there I could see a single tree rising above the

stone walls of a patio, but nowhere did I see anything which looked like a grove. Back of the town the cerro de San Miguel rose in all its cactus-dotted barrenness. 'Is it possible,' I asked myself, 'that there can exist, in such a region as this, the gardens of which we have heard?'

"But I was told to wait; and after crossing the town and approaching the foot of San Miguel, I began to catch glimpses of clumps of trees, and walled gardens, and little streams of water running here and there. And then we climbed the hill, and the whole glorious scene was spread out before me; the town in front, with a clump of green foliage marking the site of the plaza, and to the rear, extending around the base of the hill from one side of the town to the other, the groves and gardens—*solares*, they are called—where abundant water makes possible the cultivation of fruits and flowers which otherwise could not grow in this dry region.

"Here they were, the gardens of Atlixco! Here at last were the avocados—I could easily distinguish them from the other foliage. Somewhere among all those trees below me, I thought to myself, must be the parent Fuerte, and the parent Puebla, and many other trees I had come so far to see!"

It is probable that any other California horticulturist possessing a deep interest in avocados would have been subject to much the same impressions upon arriving in Atlixco as those which I experienced on the day I wrote the above paragraphs. I am certain that he would have been surprised to find a region so strikingly suggestive of his own State, and I am equally certain that he would have been thrilled as he viewed the avocado trees from the summit of San Miguel.

So far as I am aware, the attention of Californians was first publicly called to the avocados of Atlixco by William D. Stephens, in an article which he wrote for the California Cultivator in 1911. Mr. Stephens was formerly a mining man. He became familiar with the avocado in 1900, while in La Paz, Lower California. Later he was in the Mexican State of Oaxaca, and there saw avocados growing at elevations of 5,000 to 8,000 feet above the sea. The similarity between the climatic conditions of Oaxaca and southern California suggested to him the possibility of growing avocados in the latter State. He returned to California and found that a few trees were already fruiting at Monrovia, Santa Ana, Hollywood and elsewhere, and he decided to start an avocado nursery. He formed a partnership with D. E. Clower of Monrovia, and imported several thousand avocado seeds from Mexico. In the early summer of 1910 he returned to the latter country to search for the best varieties to cultivate in California. The story of his explorations in the Atlixco region I quote from an account which Mr. Stephens has kindly furnished me:

"Through friends in Mexico City I learned that Querétaro was undoubtedly the Mecca I was seeking. To Querétaro I hastened, and there I remained about two weeks examining the fruits and shipping home seeds and budwood. I was not, however, entirely satisfied with the fruits I found there. I returned to Mexico City and went through Orizaba and Córdoba to the Isthmus of Tehuantepec and the State of Chiapas. I found avocados of ordinary quality everywhere but not the superior ones I was seeking.

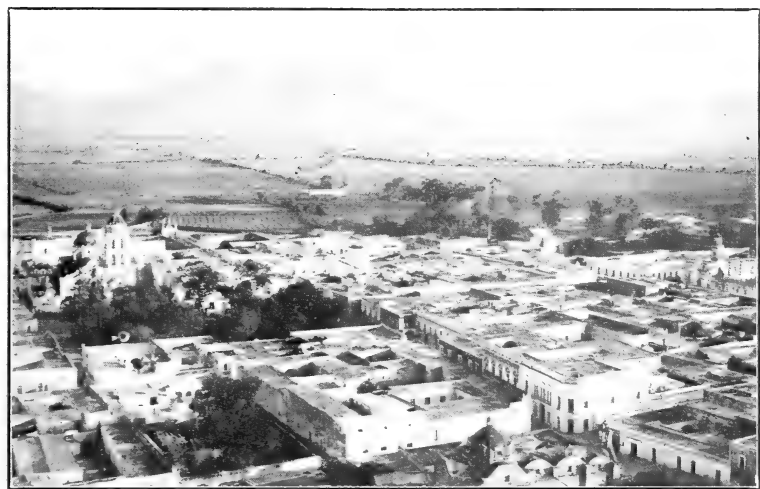
"I went back to Mexico City and fell in with Dr. Martín Espinoza, a dentist who had lived in San Francisco. He told me of the Atlixco district and its magnificent avocados. They were thick-skinned, he said, and ripened in winter and spring instead of summer. In two days I was in Atlixco.

"My Spanish was poor, so I made an effort to find someone who knew English and who could serve as interpreter for me. The second day after my ar-



THE APPROACH TO ATLIXCO

The Cerro de San Miguel, a hill about 500 feet high, and the ancient church towers at its foot combine to make a picturesque scene. The traveler arriving from Puebla first views it across the alfalfa fields visible in the foreground.



THE TOWN AND VALLEY OF ATLIXCO

This old Spanish city, lying at the edge of a fertile plain given over to wheat culture, is the Mecca of all California avocado growers. The trees upon which the avocado industry in California was founded have mainly come from the orchards which lie to the right and left of this picture.



rival I met Gabriel Fuentes, a man who had been raised in the United States. He proved to be intelligent and courteous, and best of all was thoroughly familiar with avocados, owing to the fact that he made a business of shipping them to Mexico City and occasionally to the United States. He took me through the groves and showed me the trees which produced the choicest fruits. At that time of the year, August, the latter were only half-grown and I could not sample them; but I arranged with Mr. Fuentes to ship me specimens as soon as they were matured, numbering each one and sending a description of the tree from which it came. I believe it was in January, 1911, that the first basket of Atlixcan avocados reached me in California. I had these fruits photographed, and then we selected five of them for propagation. These bore the numbers two, six, seven, thirteen and fifteen. It was at this time that I wrote a short article for the California Cultivator descriptive of the fruit, methods of preparing and serving it, and ended with some optimistic predictions regarding its future in California. In the meantime, owing to damaging frosts at Monrovia, I become skeptical about the desirability of that region for an avocado nursery and dissolved partnership with Mr. Clower.

"I formed a new partnership with A. R. Rideout, of Whittier, and as soon as the buds at Atlixco were in proper condition Mr. Fuentes began shipping to us.

"What happened to the avocado pioneers, in the winter of 1912-13, is now history: Jack Frost played few favorites, and when the smoke of battle had cleared away and we had taken stock of our salvage, all that we had left to represent our effort and expense was four plants of Number Two and five or six of Number Fifteen. From these we have since propagated others, until we now have several hundred five and six-year-old trees chiefly of the Number Fifteen variety. These trees are divided between myself, A. R. Rideout of Whittier, and G. W. Beck of La Habra. The Number Two trees at Mr. Rideout's place and the Number Fifteen at Mr. Beck's fruited lightly this past season. The fruits of both numbers were of exceptionally fine quality and desirable size (16 to 24 ounces), and we hope that further experience will show that they merit extensive cultivation in California."

Previous to Mr. Stephens' visit to Atlixco, Juan Murrieta of Los Angeles had been in touch with the region, and had secured seeds from which he raised numerous trees. Mr. Murrieta first learned of Atlixco in 1892. He entered into correspondence with Mr. Fuentes, and in January 1893, the latter forwarded a shipment of fruits. Other shipments were received at later dates. The seeds from some of these fruits were planted by Mr. Murrieta himself, while others he gave to friends in or near Los Angeles. From them came the parent trees of several well-known varieties which are now propagated in California.

I am told, also, that commercial shipments of avocados from Atlixco reached Los Angeles from 1890 until the time when communication was interrupted by the revolution,—about 1911. From some of these fruits, sold in the markets of Los Angeles, have come seedling trees which have in recent years attracted much attention.

Carl B. Schmidt, Explorer for the West India Gardens of Altadena, spent several months in southern Mexico during the latter part of 1911. He sent from Atlixco budwood of nearly thirty varieties, many of which were successfully propagated in California.

The year following Schmidt's work, Roberto Johnson, a horticulturist living in the state of Jalisco, Mexico, visited Atlixco, also in the interests of the West India Gardens, and forwarded more budwood of several of Schmidt's selections,

as well as a few additional varieties. Had not political conditions in Mexico become so unsettled about this time other visits to the region would undoubtedly have been made by those interested in the development of the avocado industry in California, but for several years Atlixco has either been occupied by the Zapatistas or subject to their raids, so that no one has desired to venture into the vicinity on a mission of this nature.

So far as I have been able to learn, the following varieties are all which have been successfully introduced into California from Atlixco (I refer, of course, to budded varieties,—that is, those which originated in Atlixco as seedlings, and of which budwood was sent to California. Varieties which have originated as seedlings in California, from seeds sent from Atlixco, are not included):

Introduction by William D. Stephens: Two varieties not yet named, grown provisionally under the numbers Two and Fifteen.

Introduction by the West India Gardens: Puebla (introduced under the number Thirteen); Fuerte (No. Fifteen); Redondo (No. Sixteen); Verde (No. Seventeen, at first called California Trapp, later changed to Verde); Merito (No. Eighteen); Perfecto (No. Nineteen); Number Twenty, a variety not named, and perhaps no longer growing in California; Number Twenty-two, a variety not named, and perhaps included with Perfecto (in case the latter at any time shows two distinct strains, it will be probable that one is the true Perfecto and the other No. Twenty-two); Colon (No. Twenty-four); Canto (No. Twenty-five); Alto (No. Twenty-eight); Atlixco (No. Twenty-nine); Oro (No. Thirty-two); Montezuma (No. Thirty-three); Miles (No. Thirty-five); Sinaloa (No. Thirty-seven); Grande (No. Thirty-nine); Schmidt (No. Forty); Obispo (No. Forty-one); Popocatepetl (introduced without a serial number); Volcan (introduced under the name Ixtacihuatl); and Modesto.

HISTORY

Undoubtedly the valley of Atlixco was an important agricultural region before the arrival of the Spaniards. The indigenous inhabitants probably cultivated maize, beans, peppers, squashes, and a few other crops.

It is evident that it did not take the Spaniards long to appreciate the attractiveness of the region, for they were already established here in 1540,—less than 20 years after the arrival of Cortéz in Mexico. Fray Toribio de Benavente, better known as Montolinia, gives us a lengthy account of the valley in these early days. Montolinia, who was the sixth Franciscan named as a missionary to Mexico, received his letters patent in Spain in the year 1523. He wrote his description of Atlixco, from which I translate* only those portions which are of most interest to us, in 1540, and died on the day of San Lorenzo in the year 1568:

“Situated four leagues from this city (Puebla) is a region called the Val de Cristo, where the inhabitants of Los Angeles (Puebla) have their vineyards and their orchards of pomegranates and other fruits, and where these things grow luxuriantly. They also have here their wheat fields, which yield nearly all the year round, in contrast to those of the *tierra fria*, which only produce a single crop annually, like those of Spain; but in this valley of which I am speaking, since it is *tierra caliente* (or at least the crops are not injured by frost) and water is always abundant, they sow and harvest continuously. Fields can be seen in which the seed has just been planted; others in which the first green sprouts break through

*I take this description from “Puebla; Su Territorio y Sus Habitantes,” by Enrique Juan Palacios, Mexico, 1917.

the surface of the ground; others in which the wheat is in full leaf and heading out; and still others with ripened grain ready for the harvest. This is a very common sight. Bread made from this wheat is extremely good, so much so that it can be said the people of this city eat nothing but *pan de boda* (wedding bread). The riches of this favored region are increased by the mulberry trees which have been planted and are continuing to be planted, for great preparation is being made to produce silk. So fertile is this plain on which is situated the district which I have called the Val de Cristo, that I doubt if there is another better, or even equal to it, in all New Spain; farmers versed in their calling and those who are competent to recognize good soil say that this plain is better than those of Granada and Orihuela.

"The Spaniards call this plain the Val de Atlixco; among the Indians it has several names, since it is a large region. Atlixco means *spring*, or *source of water*; in the spot properly known by this name, two leagues above the Spanish settlement of Val de Cristo, is a large and beautiful spring, whose waters give rise to a river which irrigates a large part of the broad and very fertile valley; there are also other streams and many springs and brooks. Close by this large spring is a town which bears the same name, Atlixco, or San Pedro de Atlixco.

"Aside from the crops grown by the Indians on this plain, among which are some of great value, especially fruits and *centli* or maize (which produces two or three crops a year), peppers, garlic, beans, cotton and other crops succeed here. It is a valley in which many mulberry trees have been set out; an estate is being planted for the King with a hundred and ten thousand trees, more than half of which are already in place, and they make as much growth here in one year as they do in Spain in three. Some of the Spaniards who live in Puebla have five or six thousand trees, each one planting as many as he can care for. The silk which will be produced here will yield immense wealth.

"This valley produces melons, cucumbers, and all the vegetables which can be grown in *tierra fria*. It should not be called *tierra caliente*, inasmuch as it only resembles the latter zone in the absence of killing frosts; in other respects it is as temperate as other regions, including that in which the Spaniards have settled. There is a characteristic of the valley often noted by Europeans, which is that a pleasant breeze, known as the *marera*, always springs up at midday; I call this the *auram post meridiem*, after the grateful breeze which is said to have blown in the terrestrial paradise. Surely such a region as this, a delightful garden in which there is an abundance of running water, roses, and fruit trees, deserves to be called a paradise, and for this reason it is termed the Val de Cristo."

The mulberry, which Motolinio considers so promising, appears never to have added to the wealth of the valley in the manner which he prophesied, for silk-culture was suppressed by the Spanish government in New Spain in order to encourage the industry in the Orient. At the present time, there is scarcely a mulberry tree in the valley. The custom of planting and harvesting wheat at all seasons of the year also seems to have gone out of date, if it ever existed to the extent which Motolinia describes. Upon inquiry, I was told that only one crop was produced a year, but that the time of sowing may be varied two or three months.

According to Betancourt, the Spaniards who first arrived in this valley were filled with admiration at the sight of the groves of fruit trees. It is not stated what kinds of fruits these groves contained. Many of the species at present grown in Atlixco, such as the cherimoya, the sweet lime, and the peach, have been

introduced since the Conquest; it is probable, therefore, that they contained avocados, guavas, tejocotes, and a few other species known to be indigenous.

The modern city of Atlixco dates from 1579, when it was granted the royal charter and a coat of arms, the latter containing a figure of the archangel Saint Michael, holding in one hand a sheaf of wheat. The elevation of the city is 1880 meters, or approximately 6150 feet. The population in 1910 was said to be 9,219, but political disturbances have caused a considerable exodus during the last few years, and it is doubtful if more than 5,000 people reside in Atlixco at the present time.

The picturesque hill of San Miguel, which arises immediately behind the town and forms a conspicuous landmark throughout the valley, is considered to be of volcanic origin. It is formed of varicolored rocks, andesite, hornblend, and basalt being the principal ones. Its summit is about 500 feet above the plaza of the town.

Alexander von Humboldt, in his *Ensayo Politico Sobre Nueva España*, published in 1827, speaks of this valley, "Justly celebrated for its beautiful climate, the great fertility of its soil, and the abundance of delicious fruits, above all the cherimoya and many passifloras." It is strange that the avocados of this region did not attract the attention of this great naturalist. We may, perhaps, infer from his failure to mention them that the large fruited varieties, for which Atlixco is at present famed throughout southern Mexico, have not been grown here until recent years.

The Nahuatl name *Atlixco* is formed from the words *atl*, water, and *ixtli*, face, with the addition of the suffix *co*, meaning *among*, *in*, *upon*, or *above*. The word was expressed by means of a hieroglyph in the form of a rebus; the arms protruding from the bowl-like base form the conventional sign for *atl*, water; at the base of these there should be the small circular sign for *ixtli* or face, but Robelo (*Diccionario de Aztequismos*), from whom I have taken the hieroglyph, did not include it and I have thought it best to reproduce the figure exactly as given by him. In stating that the sign for *ixtli* is lacking, however, I am voicing the opinion of Mrs. Zelia Nuttall of Coyoacán, well-known for her work in Mexican archaeology, especially in the interpretation of the ancient picture writings or codices. The suffix *co* is expressed by the bowl from which the *atl* sign arises, the whole combining to read *atl-ixtli-co*, or Atlixco. This name, meaning "above the waters" or perhaps "among the waters" was doubtless given to the region because of the numerous springs which exist here.

SOIL AND CLIMATE

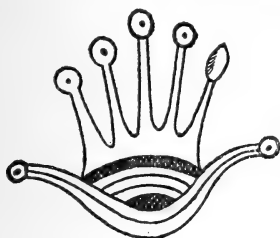
In the small area occupied by the avocado groves the soil appears to be uniform in character. It is similar to that found throughout a large part of the valley,—a friable, almost loose gray-black volcanic loam, unchanging in character to a considerable depth. I have seen cross sections ten feet in thickness in which the gray-black color and sandy texture remained the same throughout.

In my paper on the Guatemalan avocados* I have described the remarkable volcanic sands of the valley of Antigua, the greatest Guatemalan center of avocado culture. The soil of Atlixco differs in texture from that of Antigua; the latter is coarse, suggesting cinders, while the soil of Atlixco is a light loam or a sandy loam.

Water is readily available. In some places it comes to the surface, forming small springs, while in others the permanent water level appears to be as much

*Exploring Guatemala for Desirable New Avocados, in Report Cal. Avocado Assn., 1917.

as 25 feet below the surface. I noticed in the garden of Pedro Carrera a well in which the water stood at a depth of about 20 feet.



The name Atlitxco as represented in the picture-writing of the Aztecs. (See explanation in the text).

In discussing the climatic conditions of a region such as Atlitxco, one is handicapped by the lack of meteorological data. Naturally enough, such data are not obtained in the small towns of Latin American countries, hence one must resort to the observations he can make from the presence of topographical features which influence the climate, and from the character of the vegetation. In the case of Atlitxco, we have a few data from Puebla which are of value, but must draw our conclusions regarding minimum temperatures from the presence and behavior of certain plants whose susceptibility to frost is fairly well known to us.

The valley of Atlitxco is said to be somewhat drier than that of Puebla. The rain-clouds which drift up from the Gulf coast and impinge upon the great bulk of the volcano Malintzi, precipitating their moisture upon the valley of Puebla, do not always reach Atlitxco, because of the barrier formed by the mountain range which separates the two valleys. I have been unable to obtain any records of the annual rainfall in the valley of Atlitxco, hence an approximation must be reached by subtracting 5 to 10 inches, the probable difference, from the known annual rainfall of Puebla. This latter, according to the records of the observatory of the Colegio del Estado, averaged about 36 inches during a period of five years. Using this as a basis, it is reasonable to consider the rainfall of Atlitxco 30 inches or a little less.

There are well-marked wet and dry seasons, the former extending from June to September or October, and the latter from October to May inclusive. During the dry season there is an occasional light shower, usually of no importance agriculturally. The abundance of surface water in the vicinity of the avocado orchards, however, makes it possible to irrigate the trees at any period of the year.

In regard to extremes of temperature, the maximum is not so high, nor the minimum so low, as in the avocado districts of California. The highest temperature registered in the city of Puebla during a long period of years is approximately 90° F. The minimum in the same city is 32° F. The difference in elevation between Puebla and Atlitxco results in the minimum temperatures of the latter region being higher than those of the former. It is safe to assume, therefore, that the minimum experienced in Atlitxco is not as low as 32° F. The mean annual temperature of Puebla is about 61° F.; in Atlitxco it certainly is not much higher. The presence of coffee plants in abundance is a definite indication that the usual minimum temperatures are not so low as in most parts of southern California; even better evidence of this is furnished by the zapote (*Achradelpha mammosa*), the zapote negro (*Diospyros ebenaster*), and the zapote amarillo (*Lucuma salicifolia*). All of these plants succeed in Atlitxco, but can not be grown in California. Judging by the presence and appearance of these and other cultivated plants, I do not believe it is common for this region to experience temperatures lower than 38° or 40° above zero.

It will readily be seen, therefore, that the climate of Atlitxco is not so cold in winter as that of southern California, neither is it so warm in summer. It is more equable, the seasons being less well marked by changes of temperature than they are in California.

The records at Puebla show the relative humidity of that region to have averaged 63° during a period of 10 years, and 64 during another period of five years. Atlixco should differ very little from Puebla in this respect.

So far as I can judge, this region is practically free from winds of great velocity, such as those sometimes experienced in parts of southern California. During the dry season a light breeze usually commences to blow about ten o'clock in the morning and persists until sundown. It is not sufficiently strong to affect avocado trees injuriously in any way.

PRODUCTS OF ATLIXCO

The valley of Atlixco is best known throughout neighboring parts of Mexico for its wheat, its avocados, its sweet limes and its winter vegetables. In addition to these products, however, it yields a number of others which are consumed locally or shipped to nearby cities.

The field-crops of the valley are numerous. Most important is wheat, which can be considered the staple crop. Modern methods are employed in its production, gasoline tractors having recently been brought to the valley for use in preparing the land. Wheat is sown from October to December, and harvested from April to May. The quality of the grain produced here is considered excellent. Maize or Indian corn is another important crop, particularly in the lower end of the valley. Barley is grown to a very limited extent. Peanuts are produced in large quantities; about Christmas time, carloads of them are sent to Puebla and Mexico City. *Habas* or broad beans, and *garbanzos* or chick peas are produced commercially; the common *frijol* or black bean is also a standard crop. Squashes and tomatoes are grown extensively during the winter months to supply the markets of Puebla and Mexico City. Alfalfa was formerly an important crop in the vicinity of the town, but during the last few years its cultivation has declined. Sweet potatoes of several varieties are grown commercially. Chiles of several kinds, including the large sweet chiles and the small hot ones, are important crops, as also the *tomate* (*Physalis peruviana* L.), which enters into the preparation of many Mexican stews and sauces. The *jicama* (*Pachyrhizus tuberosus* Spreng) is cultivated for its edible roots, which are eaten like turnips.

Coffee forms an important culture in Atlixco. It is planted in nearly all the *solares* or *huertas*, usually occupying the ground beneath avocados, jinicuiles, and other fruit trees. The quality of the berry produced here is said to be excellent, but the production is not great enough to make Atlixco coffee an important factor in the market. In the lower end of the valley, around Matamoros Izucar, cane is grown extensively, and a considerable quantity of sugar is annually produced. The *guaje* (*Leucaena esculenta* Benth.), an indigenous tree belonging to the Leguminosae, is very abundant around the edge of the valley, and also in the town. It produces long, slender, flattened pods, containing numerous flattened seeds which form an important article of food among the lower classes.

It may be worth while to mention the common ornamental plants found in Atlixco gardens, since they help to indicate the nature of the climate. It will be noted that most of them are plants characteristic of southern California gardens. Probably the commonest one is *Schinus molle* L., the so-called California pepper tree, here known as Peru. An ash (*Fraxinus berlandieriana* DC) and a willow *Salix bonplandiana* HBK) are also common. There is a single tree in the edge of town,—and it is a historic old giant, mentioned in the chronicles of the early travelers,—of the ahuehuete or Montezuma cypress (*Taxodium mucronatum* Ten.). One or more species of Eucalyptus have become fairly common. Casuarinas, *Ficus elastica* Roxbg. and *Araucaria excelsa* R. Br. have been planted in



LOOKING TOWARD THE VOLCANOS FROM ATLIXCO

Everywhere in this region Popocatepetl and Ixtaccihuatl dominate the landscape. This view, taken from the summit of San Miguel (whose shadow can be seen in the foreground) shows a few avocado trees around the wheat fields in the edge of town, and the Metepec mill in the distance.



THE ORCHARDS OF ATLIXCO

Perhaps one-third of the orchards which surround the Cerro de San Miguel appear in this photograph. A large proportion of the trees are avocados; the remainder are mainly jinicuales (see text). While Atlixco does not produce so many avocados as Querétaro, it greatly excels the latter in the quality of its product.



the central plaza of the town. Among ornamental shrubs the commonest are hibiscus, crepe myrtle, poinsettia, oleander, *Brugmansia arborea* Steud., privet (*Ligustrum japonicum* Thunb.), one or more species of frangipani (*Plumeria*), and the mock-orange, a species of *Philadelphus*. Roses, geraniums, violets and marguerites are abundant in nearly all the gardens. The bougainvillea is occasionally seen.

Fruit culture is important in and about the town, and the number of species cultivated is large. Sweet limes and avocados are the principal commercial fruits; but cherimoyas, guavas, and a few others are produced commercially in a small way. Following is a list of the species which I observed during my stay, with their local names (Spanish), the English names, and a note regarding the importance of each:

Achradelpha mammosa O. F. Cook. Mamey: sapote. Rare; not entirely successful.

Amygdalus persica L. Prisco: durazno: peach. Common.

Annona cherimola Mill. Chirimoya: cherimoya. Commercially important.

Carica papaya L. Papaya. Rare.

Casimiroa edulis LaLlave. Zapote blanco: white sapote. Abundant.

Citrus aurantifolia Swingle. Limon: lime. Rather abundant.

Citrus aurantium L. Naranja agria: sour, bitter, or Seville orange. Rare.

Citrus grandis Osbeck. Toronja: grapefruit. Rare.

Citrus limetta Risso. Lima: sweet lime. Commercially the most important fruit of Atlixco.

Citrus medica L. Cidra: citron. Rather common.

Citrus sinensis Osbeck. Naranja dulce—sweet orange. Rather abundant.

Citrus sp. Lima-naranja: lime-orange. Rare.

Crataegus mexicana Moc. & Sessé. Tejocote. Rather abundant.

Cydonia oblonga Mill. Membrillo: quince. Rather abundant.

Diospyros ebenaster Retz. Zapote negro: zapote prieto; black sapote. Rather common.

Eriobotrya japonica Lindl. Nispero del Japon: loquat. Rather rare.

Ficus carica L. Higo: fig. Rarer.

Hylocereus sp. Pitahaya. Rare.

Inga jinicuil Schlecht. Jinicuil. Very abundant.

Lucuma salicifolia HBK. Zapote amarillo: yellow sapote. Rather rare.

Malpighia mexicana Juss. Nanche. Rare.

Malus sylvestris L. Manzana: apple. Rare.

Magnifera indica L. Mango. Not entirely successful, but rather abundant.

Monstera deliciosa Liebm. Piñanona. Rather common.

Morus sp. Mora: mulberry. Rare.

Opuntia sp. Tuna: prickly pear. Abundant.

Passiflora ligularis Juss. Granadita: granadilla. Abundant.

Persea americana Mill. Aguacate de China: paha: avocado. Commercially important.

Persea drimifolia Cham. & Schlecht. Aguacate corriente: Mexican avocado. Commercially important.

Prunus armeniaca L. Chabacano: apricot. Rather rare.

Prunus capuli Cav. Capulin; wild cherry. Rare.

Psidium guajava L. Guayaba: guava. Abundant.

Punica grandatum L. Granada: pomegranate. Rather common.

Pyrus communis L. Pera: pear. Rather rare.

Spondias mombin L. Ciruela: red mombin. Very rare.

Vitis vinifera L. Uva: grape. Very rare.

From the above list of fruits it may be deduced that Atlixco lies at the meeting point of the *tierra caliente* or tropical zone and the *tierra fria* or temperate zone (so-called). Fruits of the first-named region, such as the mango, the papaya, and the zapote negro, do not grow with such luxuriance as at lower elevations. On the other hand, the fruits of the temperate zone, such as the apple, the pear and the apricot, can be grown, although they are not so successful as at higher elevations. Fruits suited to a climate midway between the tropical and the temperate (using these terms as they are applied in Mexico), such as the avocado and the cherimoya, find in Atlixco optimum conditions.

AVOCADO CULTURE IN THE VALLEY OF ATLIXCO

Atlixco, while not the greatest avocado region of Mexico, from the standpoint of production, is probably entitled to the palm in so far as quality of fruit is concerned. Querétaro has more trees and produces much more fruit; but the Mexican race is the only one grown in that region, and the fruits are small. Atlixco, on the other hand, produces not only some large-fruited varieties of the Mexican race, but also the splendid examples of the Guatemalan for which it is renowned.

I can, perhaps, convey an idea of the extent of the orchards by describing them as seen from the summit of the cerro de San Miguel. Climbing this hill from the edge of town, you see spread out before you the broad valley of Atlixco, with Popocatepetl towering up on the northwest, only a few miles distant, and the lower stretches of the valley,—the Matamoros region,—far to the south. Below you, on one side of the hill, lies the town, covering an area one-half to three-quarters of a mile in diameter. Extending around the base of the hill, from one edge of the town to the other, and forming nearly three-quarters of a circle, are the *huertas* or *solares*,—the gardens of Atlixco. These form a belt nearly half a mile wide at the point where they join the southern end of town, narrowing to less than a quarter of a mile on the west and north, and broadening again to slightly more than a quarter of a mile where they unite with the northern end of town. The belt is perhaps three-quarters of a mile in length. These figures are all approximate,—the estimates which I made when standing on the hill.

These gardens, while devoted to the cultivation of numerous fruits, as well as other crops, contain so many avocado trees that in places the appearance is that of an orchard planted exclusively to this fruit. In other places there are many *jinicuiles* growing among the avocados, and always there are other trees which are not noticeable from the hill because they are low-growing and are over-topped by the avocados. Here and there is an open space where wheat, alfalfa, or some other crop is planted.

In addition to the trees in this belt there are other plantings of avocados in the valley, but I did not see any of them. The nearby town of Tochimilco bears the reputation of producing fruits as good as those of Atlixco itself, and the quantity grown is said to be considerable. There are also many trees in the villages and haciendas between Atlixco and Matamoros, not to mention a large number in Matamoros itself. At some future time, when conditions are more favorable, this entire region should be thoroughly explored for desirable varieties. I believe such an exploration would bring to light several worthy of introduction into other countries.

Of the Guatemalan race I do not believe there are more than 500 trees in the huertas encircling the base of San Miguel. The Mexican race is more extensively grown than the Guatemalan. I have estimated the number of trees to be at least four times that of the latter, or 2,000. These figures are, of course, only rough estimates, since I did not have time to take an accurate census.

I have obtained no definite information regarding the history of avocado growing in this region. It is reasonable to assume that the Mexican race was known here before the Conquest. As to when the Guatemalan was introduced, it is idle to venture a guess without more data than I have at present. It is interesting to note that this race is not generally grown throughout this part of Mexico. I have seen avocados from other regions, e. g., Ozumba and the state of Guerrero, which appeared to be Guatemalans, but it seems that the race is not common north of Atlixco. I know it to be grown in Oaxaca, and further south in the State of Chiapas. One is, perhaps, justified in suggesting that it has reached Atlixco from some region to the south, and it appears that this is the northernmost point in Mexico where it is cultivated extensively. However, I have not been able to visit every part of the country and consequently do not feel safe in making generalizations of this nature.

The distinction between the two races is not clearly made by the people of Atlixco. They classify avocados as *primera* and *segunda clase*, first and second class. The first class includes all of the larger fruits, which are Guatemalans with the exception of a few large-fruited varieties of the Mexican race. In the second class fall the smaller fruits, including most of the Mexicans and a few inferior Guatemalans. In the local market prices are quoted on avocados accordingly as they are first-class or second-class fruits.

In addition to this commercial classification there is another commonly, though loosely, used. This consists of the following groups: *ahuacate de China*; *pahua*; and *ahuacate chico* or *ahuacate corriente*.

The term *ahuacate de China* is of indefinite application. In general it implies fruits of good size and quality, especially those which are smooth and comparatively thin-skinned. Most of the fruits known under this name are Guatemalans, but the largest Mexicans also pass as ahuacates de China. The name is said to have reference to the character of the skin; "*papel de china*" is the term commonly used for tissue paper, hence its application (abbreviated to *China*) to an avocado indicates that the latter has a skin as thin as tissue paper,—figuratively speaking. This explanation of the name does not seem to be characterised by logic in a high degree, but it is the only plausible one I obtained, after making numerous inquiries.

Pahua, from the Aztec *pauatl* (meaning *fruit*) is the name applied to thick-skinned avocados of the Guatemalan race. According to some growers, only those fruits which are round or oval in form are pahuas, the rest being ahuacates de China; according to others, the pahuas are characterized by a sweetish, watery flavor, and is lacking in richness. In any event, it is evident to me that the name pahuas connotes to the Atlixcan mind a fruit of rather inferior quality, hence a grower will rarely describe any of his own fruits as pahuas, all of them being ahuacates de China; while those grown by his neighbor are (to his mind) all pahuas. When you visit the neighbor in question, however, he reverses the classification.

The term *ahuacate chico* or *ahuacate corriente* (small ahuacate or common ahuacate) is applied to small-fruited varieties of the Mexican race. This includes the great majority of the trees grown in Atlixco. The largest fruits of the Mexican race are called ahuacates de China. The probable hybrid, *Fuerte*, is

also known by this name, though the owner of the tree refers to it as "ahuacate verde" or "green ahuacate," because of its color when ripe.

I will not here enter into a discussion of the botanical differences which distinguish the Guatemalan and the Mexican races, since they have elsewhere been treated as fully as the present state of our knowledge will permit. Suffice it to say that the Guatemalan, so far as we know at present, is a horticultural race of *Persea americana* Mill. (*Persea gratissima* Gartn.) developed in or suited to tropical highlands. It withstands more cold than the lowland or "West Indian" form of the same species. The Mexican race (so-called) appears to be a distinct species, *Persea drimifolia*, described by Chamisso and Schlechtendahl in 1831. Horticulturists in the United States are now familiar with the characteristics of the Guatemalan, West Indian, and Mexican races.

Most of the avocados observed in Atlixco can easily be classified as either Guatemalan or Mexican. I found a few trees however, whose fruits were rather puzzling. Fuerte is the most noteworthy of these, and after careful examination I believe this to be a hybrid between the two species. Elsewhere in this paper I discuss its characteristics more fully. Several varieties were seen which in most respects resembled the Mexican race, but they were larger in size and had thicker skins than usual. At first I thought that some of these might be hybrids like Fuerte, but on further study I found no evidence which warranted the retention of such a belief. Puebla is one of these varieties, and the others were similar to it in character.

CULTURAL PRACTICES

Little can be said regarding the planting of avocados in Atlixco, for it seems rarely to be intentional. The situations in which the trees are found suggest that in most cases they are volunteers. I have seen a few plants growing in flower pots or tin cans, to be planted later in the orchard; but the groves now in existence do not appear to have been systematically planted.

No instances were observed in which avocados had been budded or grafted, or propagated in any way except by seed. While sweet limes are commonly propagated in Atlixco by stem-layering (marcottage) and the pear is occasionally cleft-grafted on the tejocote, no asexual method of propagation seems to be applied to the avocado.

Sometimes two trees will not be more than six feet apart, in other instances they may be fifty, or a single tree may stand alongside a small field or patch of cultivated ground. There is no uniformity whatever in this respect.

Avocados are found in Atlixco under three rather distinct sets of cultural conditions. These are: (1) trees growing in grain fields, where the ground receives tillage incidental to the planting and cultivation of wheat or maize; (2) trees growing in huertas containing a varied collection of fruit trees and perhaps coffee bushes, and where the ground is occasionally cleaned with a hoe and thus kept reasonably free from weeds and grass; and (3) huertas such as those under (2) except that the ground is not cleaned, weeds and grass being allowed to develop unhindered.

I cannot determine which of these produces the best results, as trees look very much alike under all three sets of conditions. It would require a long period of careful observation to settle this matter.

Practically the only cultural attention given intentionally to avocados in this region consists of irrigation during the dry season,—October to May. Throughout this period water is run thru the huertas every 15 to 30 days. The typical Atlixcan avocado grower turns the water into his huerta thru a small



AN AVOCADO GROWER AND HIS PICKING-HOOK

This hook is used in Atlixco to pick sweet-limes, avocados and other fruits. For the large Guatemalan avocados it is sometimes supplemented by a cloth sack suspended below it to catch the fruit as it is pulled from the tree.



ATLIXCO'S BEST

These fruits represent the cream of the Guatemalan seedlings grown in Atlixco. The largest weigh nearly two pounds, and all have small seeds.

ditch from one of the numerous small canals; no system of furrows is used to carry the water to all the trees, but the grower rolls up his trousers and stands nonchalantly about with a hoe, occasionally excavating a short furrow to conduct the recalcitrant liquid to some portion of the huerta where the force of gravity would not otherwise take it. After the water has run over the ground for half a day, the supply is shut off and the work is considered finished. No tillage is given after irrigation to break up capillarity and conserve moisture, but as the ground is in many cases shaded by a dense growth of trees and shrubs, evaporation is retarded to a helpful degree.

I observed no evidence of pruning except where large dead limbs had been cut away from old trees, and where the system of tree renewal observed in Orizaba and Queretaro* had been practiced. This system appears to be employed less frequently in Atlixco than in either of the two regions mentioned.

The trees differ in habit, some being broad and spreading, others tall and strict. There is less variation in this respect, however, than is usually noticeable in Guatemala. The lower limbs are nearly always cut away, forcing the crown to develop six to ten feet above the ground.

THE CROP: SEASON OF RIPENING

It is said that avocados are marketed in Atlixco during every month of the year. This would not be remarkable, were it not that the entire supply is obtained locally. In Guatemala City avocados are always on sale, but they come from many different elevations, consequently they do not necessarily represent varieties distinct in ripening season, since the period required for the fruit to mature is lengthened or shortened by increase or decrease in elevation. Thus a single variety, if grown at elevations of 2,000, 4,000, 6,000, and 8,000 feet in Guatemala (or elsewhere in tropical America) would supply ripe fruit throughout most of the year.

Atlixco has, of course, a decided advantage over Guatemala in that two races are commonly grown, one ripening in winter and the other in summer. Another factor of great importance is the tendency of certain trees of the Mexican race to produce two crops annually.

If all avocados were left upon the tree until *fully* mature it might not be possible to have an extensive supply throughout the year, but here as elsewhere in tropical America many are picked one to three months before they have reached complete maturity. This pernicious habit extends the season, but results in obtaining for the fruits a reputation for inferior quality which they do not deserve.

The Mexican race ripens its main crop in Atlixco during July and August. A few fruits may hang on the trees until October or even November. In addition to this main crop, there is an early crop, called the *cuaresmeño*, produced by some of the trees but not by all. This early crop matures in March and April, thus filling a gap which would otherwise intervene between the Guatemalan and Mexican races, for the Guatemalan fruits are never allowed to remain on the trees until April, and the main crop of Mexicans does not begin to ripen earlier than June. The *cuaresmeño* crop of Mexicans is, therefore, of great importance. We have observed this same tendency to produce two crops annually in the case of the Northrop and a few other trees in California, but it has never been considered a factor in connection with the commercial production of avocados. I believe we should devote more attention to this matter. It may be possible to obtain

*See "The Avocados of Mexico: A Preliminary Report," in Report Cal. Avocado Assn., 1918-1919.

from Mexico good varieties of the Mexican race which will give us two crops of fruit during the year.

The season for Guatemalans in Atlixco is October to March. That is to say, the fruits are picked during this period. I greatly doubt if many of those gathered in October are mature. There is a decided tendency to rush the fruits to market as soon as they are full grown, because of the danger from fruit-thieves. Many of the growers complained bitterly to me of their inability to harvest their own crops. "*Todo el mundo es dueño ahora*" ("Anybody and everybody is the proprietor nowadays") one old orchardist kept repeating during the morning I spent with him in his huertas. Thieves were always troublesome in this region, but since the revolution their numbers have multiplied and their audacity is unlimited.

Comparing the ripening season with that in California, I believe it to be, on the whole, about two months earlier. This is more than can be accounted for by the elevation of Atlixco. As explained in my paper on the avocados of Guatemala, the ripening season in California corresponds to that at elevations of 6,000 to 7,000 feet in tropical America, while the season in Florida corresponds to 3,000 to 4,000 feet in tropical America. Atlixco lies at an elevation of 6,000 feet, and should, therefore, have practically the same season as California. The difference of two months is probably due to the sheltered position of Atlixco, and the consequent warmth of this climate. The town is protected on the north by high mountains, and lies at the upper end of a broad valley which falls away toward the south.

I would expect a variety whose season in Atlixco is January to March to ripen in California from March to May. In stating that its season in Atlixco is January to March, however, I imply that these are the months during which fully mature fruit can be picked, and not necessarily the ones in which the Atlixcans would harvest the crop.

THE CROP: PICKING AND MARKETING

The difficult question of determining when an avocado is sufficiently mature for picking seems to have been given little attention in Atlixco. I do not find that the rule followed in Guatemala is observed here. This rule is to the effect that the fruit can be gathered when the tree comes into flower, and in any event would probably apply only to avocados of the Guatemalan race.

Purple-fruited varieties are commonly considered to be mature when the color begins to change from green to purple. In respect to green-fruited varieties, I have not found that the growers have any accurate means of determining when they are mature, in spite of the fact that several have asserted to me that they did. They probably know in what month they are accustomed to pick the fruit from their various trees; but if shown a new variety and asked to state whether or not the fruit was mature, I believe they would be unable to do so.

Vicente Suarez, an old Indian who owns several huertas, was assuring me that he not only could tell just when a fruit was mature, but he could also tell by looking at it just what its quality was, and how large a seed it contained. I happened to hold a small avocado in my hand. "For example," I asked him, "What will be the quality of this fruit, and how large its seed?" He gravely examined it, pointed out several small brown dots which he intimated were infallible indications of something or other, and then replied: "It is of excellent quality, and has a very small seed." I took it home and cut it, to find that the seed was so large there was scarcely any space left for flesh. What there was of the latter was rich and of fine flavor, but I later learned that my assistant had

privately passed the word to old Vicente that the fruit had been given me by a friend who recommended it as of unusually fine quality.

In picking avocados, some of the Atlixcans employ more intelligence than is generally used in this connection in tropical America. They do not knock them off the trees and allow them to fall to the ground, but pick them with an apparatus which removes them carefully and catches them in a small basket or sack. This is a fruit-picker similar to those used in the United States, consisting of a hook or knife attached to the end of a bamboo pole, with a small wire basket or cloth sack so arranged as to catch the fruit when it is cut or pulled from the tree. The use of this apparatus has probably been encouraged by the high prices obtained for large Guatemalan avocados. In Guatemala, where avocados rarely bring 50 cents a hundred, the grower can scarcely be blamed for picking them in the easiest manner possible, but here, where a good one is worth 10 or 15 cents, the orchardist realizes that every one lost means 10 or 15 cents less in his pocket. It seems to be understood by all that an avocado is badly bruised if allowed to fall to the ground from a high tree, and that a bruised fruit will not ripen perfectly, nor keep well in the market. Without this understanding, of course, there would be no incentive to careful handling. Not all of the growers use this method of picking, and I do not believe it is employed by any of them except in connection with the Guatemalan race.

For shipment to Puebla, Mexico City, Veracruz, and other points in the Republic the fruits are packed immediately after picking in boxes or *huacales*, the latter being crates made of small round sticks. Usually no packing material is employed, but when it is desired to pack with especial care the fruits are wrapped separately in paper. Sr. Fuentes, who formerly exported avocados from this region to the United States, packed in large baskets, with abundant hay or straw to prevent bruising; but as no fruit is now being exported this method seems to have fallen into disuse. The huacal is the commonest package. It usually measures 2x2x2 feet, and the fruits are packed fairly tightly so they will not shake about while in transit.

After packing, the fruits require five to ten days to soften, and after softening can be kept on the market for several days before they spoil. When received in the market they are examined and the soft ones picked out and placed on the fruit stands for immediate sale. If not sold within five or six days they are lost. If it is desired to hasten softening, the fruits are placed in a tight box with hay, leaves, or a blanket over them; if, on the other hand, it is desired to retard ripening, they are kept in the open air, as cool as possible.

Small fruits ("ahuacates de segunda clase," mostly of the Mexican race) net the growers \$1.50 to \$3.00 per 100 at the orchard. The larger ones ("ahuacates de primera," mostly of the Guatemalan race) net them \$12.00 to \$15.00 per hundred, occasionally more. These prices are in Mexican currency, on a gold basis. Much of the fruit produced in Atlixco is sold in the local market at wholesale to buyers who come from Puebla, Mexico City, and other points.

THE CROP: CHARACTER OF THE FRUIT

Comparing the fruits of the Guatemalan race produced in Atlixco with those of Guatemala itself, I believe the Atlixcan varieties average somewhat larger in size; are smoother on the surface; and have smaller seeds. In quality, I believe the average is about the same in both countries.

Contrasting the *extremes* of each characteristic as they occur in these two regions, we find that the largest fruits observed in Atlixco weigh only two pounds,

while the largest in Guatemala weigh three pounds. This in spite of the fact that the average fruit of Atlixco is larger than the average of Guatemala. In quality, I am satisfied that the best fruit I tested in Atlixco was not equal to the best ones I found in Guatemala, which latter are represented by several varieties in the collection introduced for trial in the United States. The smallest seeds observed in Atlixco (considering the size in relation to that of the entire fruit) are smaller than any observed in Guatemala, with possibly two or three exceptions. The thickest skin noted in Atlixco was not as thick as many seen in Guatemala.

I have not had an opportunity to examine critically many fruits of the Mexican race grown in Atlixco, as they were not in season at the time of my visit. I have seen some of them in the markets of Orizaba and Veracruz, however, and I found them to be much above the average of this race. Undoubtedly there are many small, ordinary seedlings, but there seem also to be some which excel those of Querétaro and most other regions.

THE FUERTE AVOCADO

Fuerte is at present the most extensively planted and is generally considered the most promising of all the avocados which have been introduced into the United States from Atlixco. My desire to see the parent tree was the principal motive for undertaking the trip of which this paper is a report. I felt that North American avocado growers should know as much as possible about Fuerte; if it was representative of a race or group cultivated in Atlixco, and there were better varieties of the same general character to be obtained, then we should not plant it too extensively; if on the other hand it proved to be unique, and superior to the other avocados of its region, we could enlarge our plantings with greater confidence.

Perhaps I can most accurately present my observations on this variety by quoting from my Journal entry of December 19, 1918:

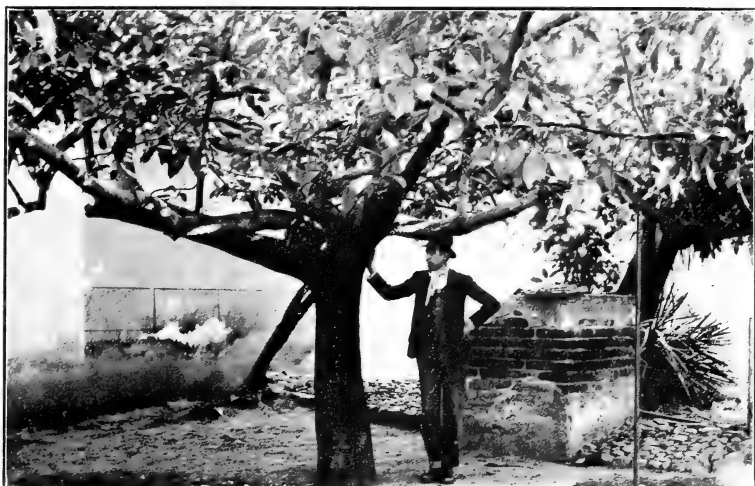
"This morning I went out with Carl Schmidt's notes and diagrams to hunt up some of the avocados which have been propagated in California.

"Fuerte was the variety I was most desirous of finding. After considerable search I succeeded in locating it. Schmidt gave the name of the owner as Matildi Dion. This is incorrect. The owner is Alejandro Le Blanc, a Frenchman by birth, now a Mexican citizen; Matildi Dion, now dead, was a relative of his and formerly lived on the property, which is situated at No. 2, Calle Manuel Buen Rastro.

"The son of Alejandro Le Blanc, a decidedly *simpatico* young fellow, showed me over the place and told me everything he could about the Fuerte tree.

"On a small branch I found the copper label put on by Carl Schmidt in 1911. It bore simply the number 15, which is the serial number under which Schmidt sent budwood of the variety to California in 1911. Le Blanc told me he had been careful to preserve this label, having loosened the wire on several occasions when it was cutting into the limb.

"In this tree Le Blanc possesses something of unusual character, as well as merit, and he knows it. The family is so fond of the fruit that they always keep the entire crop for their own use. Not only do they consider the flavor unusually rich, but they say that the seed is exceptionally small, leaving an abundance of meat. In addition, the tree is peculiar in that it ripens its fruits over a much longer period than any other known to them. They call it "*ahuacate verde*" because it remains green in color when ripe. They know when the fruit is ready to be picked by the yellowish tinge which it assumes on one side.



THE PARENT TREE OF THE FUERTE AVOCADO

At the present time no tree in Atlixco is of greater interest to Californians than the parent Fuerte, which stands in the garden of Alejandro Le Blanc. It is believed to be about 60 years old, and its crown is approximately 25 feet high and 30 feet in spread.



THE MEXICAN AVOCADO

This large tree, almost ideal in form, is growing in the edge of a small wheat field. Its development has been unhindered, and the cultural conditions are unusually favorable. Such a tree should yield annually several thousand small fruits.



"Young Le Blanc says they picked about 200 fruits last month (November), and there are about 200 more on the tree which are maturing very slowly. Most of them will not be ready for picking until January or February. The tree is now putting forth a few flowers. Unquestionably its fruiting habits are peculiar. Le Blanc says that it bears every year but that some seasons it produces heavier crops than others. He thinks 600 fruits is a good crop, but says if the tree were given better care it would yield a thousand.

"The age of the tree is not known, but Le Blanc, after having investigated the matter as carefully as possible, believes it to be between 55 and 60 years. In 1911 Carl Schmidt, in his notes on the variety, estimated the age at 25 years, a figure which Le Blanc at that time thought to be correct.

"The form of the tree is rare. It is very broad and spreading, though not drooping. The main limbs extend almost horizontally from the trunk. The crown can not be considered large. I have taken the following measurements:

Circumference of trunk at ground.....	69 ins.
Distance from ground to first branches.....	5 ft.
Number of main branches.....	5
Greatest spread of crown.....	33 ft.
Height, approximately.....	27 ft.

"The tree is growing in the corner of Le Blanc's *huerta*, with a high wall near it on one side, and the house not far away on another side. The ground beneath its branches is clean and level, but not cultivated in any way. Le Blanc tells me the tree receives plenty of water; in addition to that which reaches it when the *huerta* is irrigated, there is a drain below the surface of the ground, a few feet from the trunk, and doubtless the seepage is considerable. In appearance the tree is healthy and vigorous."

Sr. Le Blanc generously gave me a dozen fruits, the best on the tree, and I carried them with me to Mexico City. I sampled them as they ripened, one by one, and prepared a description of the variety which I here publish in order to place on record the character of the fruit produced by the parent tree:

Form varying from pyriform (not necked) to oblong, the majority of fruits slender pyriform in outline. No round fruits such as those said to have been produced by one *Fuerte* tree in California were found on the parent tree. The weight is 8 to 12 ounces. The variation in weight is not as great as in many other varieties, most of the fruits weighing about 10 ounces. The surface is distinctly pebbled, often having a wrinkled appearance around the base of the fruit. The color is uniformly dull green, with numerous small yellowish dots. The skin has a maximum thickness of 1 millimeter; toward the stem end of the fruit it is slightly thinner than near the apex. In texture it is very pliable, but it is sufficiently tough so that the flesh can easily be dipped out of the skin with a spoon. The skin peels readily from the flesh when the fruit is fully ripe; its inner surface is characterized by none of the hard granules which are typical of the Guatemalan race. In thickness and texture of skin *Fuerte* is similar to the thickest-skinned forms of the Mexican race, but it seems tougher than that of any Mexican which I have examined. The flesh is rich cream-yellow in color near the seed, changing to pale green near the skin, the greenish zone extending one-third of the distance from skin to seed. There are often traces of fiber in the flesh around the base of the seed. In texture the flesh is fine-grained, smooth, very buttery or oily, with none of the watery character often found in the Guatemalan race. The flavor is characterized by the peculiar richness or nuttiness typical of the Mexican race, as opposed to the distinct flavor of the Guatemalan. The seed is relatively small to medium in size, and fits snugly in the cavity. The cotyledons are often unequal in size. When the ripe fruit is opened, both seed-coats cling to the seed, but sometimes they are not closely united and may be separated with ease. The surface of the cotyledons is nearly smooth.

In the 1916 Report of the California Avocado Association, page 142, appears a photograph of two entire and two half fruits, one of each round, the

other oblong-pyriform. Beneath this photograph is the following legend: "Bud variation in Fuerte avocado (one-half natural size). On right normal Fuerte fruit, on left round fruit of Redondo type produced on the same budded tree of the Fuerte on the ranch of Mr. J. T. Whedon, at Yorba Linda, Cal. The tendency of this variety to produce two types of fruit is said to be the cause for the naming of two varieties, Fuerte and Redondo, when they were imported from Mexico. The Redondo is now known to be the round fruited bud variation of the Fuerte."

I found no fruits on the parent Fuerte tree which varied strikingly from the type. Redondo is a distinct variety, not to be confused with Fuerte: the parent tree, which I have examined, is growing in the garden of Salvador Amor, as indicated by Schmidt in his notes. The fruit is very thick skinned, and in size and form resembles Challenge. Redondo is a true Guatemalan in every respect.

The probability of Fuerte being a cross between the Mexican and Guatemalan races has been discussed in print on several occasions. Scarcely had the variety commenced to fruit in California when this was suggested as a hypothesis to account for some of its extraordinary characteristics, and as time has passed, belief in its hybrid origin has grown stronger. Doubt always remained in my mind, however, until I had visited Atlixco. I had suspected that Fuerte might represent a distinct race found in that region. I found nothing to indicate, however, that Atlixco possesses any races or groups not already known to us. The Mexican and the Guatemalan, as grown in Atlixco, differ in no important characteristics from these races as we know them in California. No trees were found which closely resembled Fuerte in habit and fruit, though I looked particularly for such.

I feel, therefore, that it is now more reasonable than ever to believe that this variety is a hybrid. In certain of its characteristics we have indications of its hybrid nature, and additional evidence has recently been furnished by the behavior of its seedlings. A number of these have been grown at the U. S. Plant Introduction Garden, Miami, Florida. Some of them closely resemble the parent in foliage, including the possession of the anise-like odor which has been taken, in Fuerte, to indicate Mexican blood, inasmuch as this odor is never present in true Guatemalans or West Indians. Others are typical Guatemalans in appearance, and have lost the anise-like odor. It will be interesting to watch these seedlings come into bearing. It is possible, of course, that some of them are the result of cross-pollination, flowers of the Fuerte having been visited by insects carrying pollen from trees of other varieties; but their behavior is decidedly different from that of ordinary avocado seedlings.

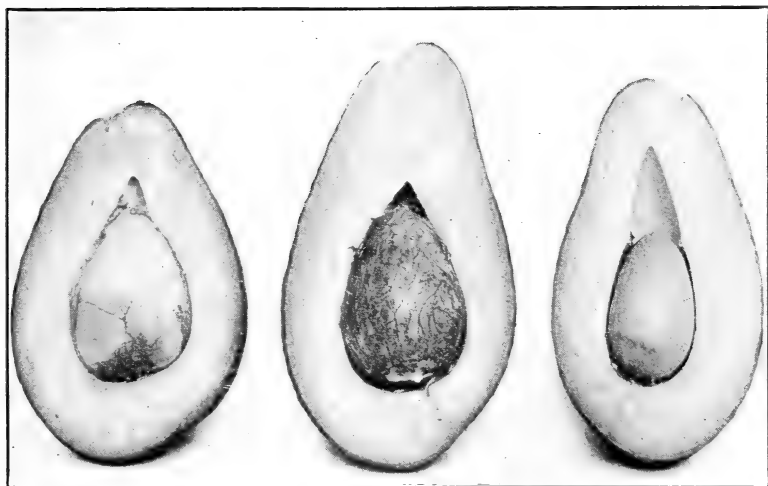
While it has not been possible for me to keep in close touch with the avocado industry in California during the past few years, I had formed a high opinion of Fuerte from what I had seen and heard of its behavior in that State. In Florida, also, it has shown much promise. My visit to Atlixco served to increase my confidence in this variety, and I believe any California avocado grower who could have shared my week there would have come to feel the same way. Let me, if I can, make my position clear.

We have recognized that Fuerte was an unusual variety, and its hardiness, its vigorous growth, its tendency to fruit while very young, its season of ripening, and the excellent quality of its fruits have combined to make us realize that it possessed exceptional value. But always we have felt that perhaps in the region from which it came there were even better varieties which we could and should obtain; that Fuerte, in other words, might be representative of a group or race occurring in



VARIATION IN FRUITS FROM THE PARENT FUERTE

These fruits, here shown reduced in size, represent the range of variation which occurs among the avocados borne by the parent Fuerte tree. Each of these specimens weighs about 10 ounces.



FRUITS FROM THE PARENT FUERTE

These are the same fruits which were shown, entire, in the last illustration. The seed is variable in size, and the yellow flesh is unusually rich and pleasant in flavor. This variety is considered by those familiar with it one of the best in Atlixco, if not better than all other varieties there produced.



southern Mexico, and that by a brief search we might obtain other and more valuable varieties of the same race. A visit to Atlixco has served to clear away these doubts, and make me realize that in Fuerte we have secured a unique avocado.

Imagine that you have gone to Atlixco in my place. You found good avocados,—many of them excellent avocados,—all about you. Guatemalan varieties of large size and good quality, and Mexican varieties better than those of almost any other region. You looked over these fruits and were delighted with them. Then you came upon a single tree of rather distinct character, and found that its fruit was reputed to be as good as the best Guatemalan, while it had a ripening season which exactly met your requirements,—a thing which most Guatemalans do not possess. Would it not attract your attention? And as you examined it more carefully, and found that the fruit was not only of excellent quality, but that it had a tough skin and a very small seed; that the tree bore regularly and abundantly; that the ripening season was unusually long; and that it was a vigorous grower and hardier than any known variety of the Guatemalan race; would you not become enthusiastic about its possibilities?

THE PUEBLA AVOCADO

Since it has been included in the list of eight varieties recommended for planting by the California Avocado Association, Puebla is worthy of more than passing notice.

In the circular issued by the Association (Circular No. 1) the statement is made: "Puebla is not strictly a Guatemalan type, but is supposed to be a hybrid." A careful examination of the parent tree, growing in the huerta of Vicente Pineda, in Atlixco, and of its fruit, has satisfied me that Puebla is a representative of the Mexican race, and not, like Fuerte, a hybrid between the Mexican and the Guatemalan. I was unable to find a single character which indicated hybridity, while in Fuerte there are several. Puebla is later in season than most other varieties of its race, but this is the only way in which it seems to differ from them. The character of its fruit is purely Mexican, so far as I could see, and the tree is a typical Mexican, both in appearance and in the anise-like odor of its leaves.

It was impossible to obtain a satisfactory photograph of the parent tree, owing to its situation. It is crowded between several other avocados, with pomegranate bushes close beside it. It is not large, perhaps 25 feet high, and is slender in habit, with a trunk about 10 inches thick. It does not seem to be in vigorous condition. When I saw it, on December 19, there were only two fruits left on it. I was informed by the caretaker that the bulk of the crop had been picked in September. The season of this variety in Atlixco can be considered September to December.

The fruits which I obtained were small and probably not typical of the variety. They were obovoid in form, rather broad at the base, with the perianth-segments persisting around the stem,—one of the characteristics of the Mexican race. The surface was smooth, slightly glossy, dull maroon purple to purplish black in color, with minute reddish dots. The skin was 0.5 to 0.7 millimeters thick, leathery, rather firm, peeling readily from the flesh but not granular in texture. The flesh was cream-yellow near the seed, changing to pale green toward the skin, buttery and fine-grained, with the fiber markings not very conspicuous. The flavor was rich, nutty, and very pleasant. The seed was proportionately large, tight in the cavity with both seed coats closely surrounding the cotyledons.

Puebla can be considered an unusually good fruit of the Mexican race, particularly valuable because of its lateness in ripening.

AVOCADO PERFORMANCE RECORDS

A. D. SHAMEL, RIVERSIDE, CALIF.

Mr. President, Ladies and Gentlemen:

The reason for my presenting this discussion of the work of keeping individual avocado tree performance records is that Mr. L. B. Scott, in charge of this investigation for the U. S. Department of Agriculture, has written me that official duties prevent his attending this convention as planned, and requested that I prepare a paper on this subject in his stead. The only personal experience with avocado performance records which warrants my attempting this duty has been a very limited connection with the variety committee of this Association. The ideas which I will discuss in this paper have developed as a result of our experience during the past ten years while keeping individual citrus tree performance records. Enough evidence has been secured with avocado tree records to warrant the belief that such records are as important in the selection of parent trees and bud wood for the propagation of reliable varieties and strains of the avocado as has been proven to be the case with the citrus. In fact it seems to me that such records are more important for the avocado than for the citrus, for the reason that the commercial propagation of avocado varieties is still in its infancy. Therefore, it seems reasonable that exact information as to individual avocado tree behavior will enable the propagators and growers of avocados to avoid many of the mistakes made in the early propagation of citrus varieties.

My point of view is that the avocado growers and propagators have a wonderful opportunity at this time through tree performance record work to select superior varieties and strains for commercial propagation so that from the very beginning of this industry only valuable varieties will be planted in the commercial avocado orchards. I firmly believe that careful study along this line may shorten the experimental work essential to the selection of suitable varieties for new environment conditions at least twenty-five years. Furthermore, I feel sure that this work will enable commercial growers to avoid the serious mistakes usually incident to the introduction of new crops and in this way eliminate much of the loss and disappointment connected with the planting of unsuitable varieties in commercial orchards. I have long felt that the avocado propagators and growers in California have a unique opportunity to start off the commercial development of this industry along proven and reliable lines, and I believe that when they fully understand the importance of basing their selection of varieties and of parent trees within the varieties upon definite information and exact records that they will seriously take up and carry on this work.

I will briefly describe a method of keeping individual tree records. While this method will probably be greatly modified and improved with further experience it does meet the necessities of this work as fully as possible in the light of our present knowledge of this subject.

OBJECT OF PERFORMANCE RECORDS

The object of this work is to determine and systematically record the performance of individual avocado trees. These records include (1) a record of the number, weight, and commercial quality of the fruits borne by each individual tree; (2) the dates of each pick showing the season of production; (3) definite data as to the chemical composition and the physical characteristics of the

fruits borne by each tree from year to year; (4) the development of improved methods of propagation in order to control the extent to which undesirable varieties and variations shall enter into the population of future commercial avocado groves.

PLAN OF RECORD KEEPING

The first step in performance record work is to number each individual tree. The importance of individual tree numbers has been fully demonstrated in our citrus studies not only for keeping individual tree records, but also for giving the trees individual tree care in pruning, fertilizing, irrigating, and other cultural attention.

The most satisfactory tree number is a compound one consisting of (1) the number of the orchard or block of trees; (2) the number of the row of trees, always counting from a fixed point as the irrigation head; and (3) the number of the tree in the row. For example, a tree in block one, row three and the fifth tree in the row will have the number 1-3-5. While this number seems to be a complicated one at first thought, in reality it has proven to be the simplest and most efficient one devised as yet for this purpose.

The tree number can be applied to each individual tree by painting the figures upon the trunk or one of the main limbs, using pure white lead paint for this purpose. On very small trees the number must be arranged in a single vertical column on account of the size of the trunks. With trees of sufficient size, usually after the second year in the orchard, I think that the number can be arranged with the orchard or the block number first, the row number just below it and the tree number under the row number. The tree numbers should always be placed in the same relative position on all of the trees in order to assist the observers in finding them.

This arrangement of the individual tree number enables the grower (1) to find each particular tree in his orchard at any time without difficulty; (2) to note any tree condition at any time for immediate or future attention; (3) to easily connect a particular tree and its performance; and (4) to give the trees adequate and necessary individual tree care. The expense of applying these individual tree numbers is very small. At this time in the citrus it costs about two cents each to number the trees. The citrus tree numbers last for about five or six years after which period it is usually advisable to renew them. On account of the rapid growth of avocado trees it may prove necessary to renew the tree numbers more frequently than is the case with the citrus.

The second step in securing individual tree records is to adopt forms on which the individual tree data can be kept. The variety committee of this association have drawn up a simple form for this purpose which seems to meet the essentials of this work. From our experience in similar work with the citrus I am of the opinion that these forms should be as simple and practical as is consistent in securing the information desired. With this object in view the variety committee have printed for distribution to members of this association the following form.

In some cases it will undoubtedly add to the convenience of the user to print these forms in small, durable vestpocket books. The owner's name and address should be plainly printed in a conspicuous place on the cover in order that the book can be easily returned if it is accidentally lost. These small, thin, convenient books may be found to be of real service in securing accurate individual tree records.

It seems to me it will be very desirable that, in so far as possible, performance records be secured according to a uniform plan. This uniformity will enable the Association to more easily and fully tabulate, digest, and study the information contained in these records in order that the knowledge thus acquired be made available for the benefit of the industry as a whole.

The third step in securing individual avocado tree records is the work of recording the yield of the trees, and other notes as to their behavior. The blank form of recording these data, shown below, is largely self-explanatory as to the important steps in recording the information. Of course it is essential to record the name of the grower, his address, the year during which the records are secured, the number of the variety or strain, the age of the tree, whether it is a budded or seedling tree, and the individual tree number. Not one item in this list can be safely left out. Any additional information which will be helpful in a future consideration of the performance record should be written in on the form.

THE CALIFORNIA AVOCADO ASSOCIATION

INDIVIDUAL TREE PERFORMANCE RECORD

Grower.....Address.....Plat.....Row.....Tree.....

Year.....Variety.....Age of Tree.....Kind of Tree.....

Date of Pick	No. of Fruits	Wt. of Fruits	NOTES
.....
.....
.....
.....
TOTAL

This blank can be extended to suit any number of records

The date of each pick is important in that these dates will give definite information as to the season of production of mature fruits for the individual tree.

The number of fruits picked and their weight gives the most important information to be secured. From the number and weight of the fruits the yield of the trees can be definitely ascertained with some idea of the size and value of the fruits. This information is of primary importance in considering the commercial value of any individual tree. If possible, it is suggested that if marked variation in size of the fruits exists the weight of several of the largest and some of the smallest fruits be obtained in order to secure and record some definite information upon this condition. Other information which will aid in interpreting the performance records can usually be secured and recorded under the heading of notes. These notes may include temperature or wind records, kind, extent and nature of blemishes, or other explanatory descriptions of tree and fruit characteristics and conditions.

From experience gained in securing citrus tree records we suggest that field notes be taken with a medium or hard grade of lead pencil. Indelible pencil marks are likely to run and blur when accidentally moistened. A system of caring for the records which will prevent, so far as possible, loss from fire, accidental disappearance, theft, and other causes of loss must be used. One method of accomplishing this is to make duplicate copies of each record, one to be retained by the grower, and the other to be filed with the avocado association or other institution.

UTILIZATION OF DATA

The number of seasons' records necessary in order to base conclusions depend upon circumstances. At this stage of the development of the industry the first fruits matured on all trees should be recorded. These data will give definite information as to the age at which the trees come into bearing. In other words, these records might properly begin with the budding or the planting of the seed as the case may be. In the early stages of tree growth when no fruits are produced this fact can be noted in the blank record form. This will provide positive evidence as to the early bearing habits of the trees. In any event it seems to me that an even number of seasons' records, as for example, two, four, six or eight, are preferable to an odd number in arriving at the average yearly production. If three seasons' yields are considered in the case of an alternate bearing tree and two of them show low production the average of the three years may be misleading. On the other hand with two high yielding seasons out of three the average of the three years will show a higher average yielding power than is truly the case. Of course with regular bearing trees this condition will not apply and any adequate number of seasons may be safely considered in getting at the average annual yield.

Our citrus studies have led us to emphasize the importance of a sufficient number of seasons' records to justify safe conclusions as to a tree's habit of bearing. With trees just coming into bearing I believe that four or six seasons' records are desirable before safe conclusions can be drawn and reliable selection of parent trees be made. With full bearing trees I think perhaps that two successive normal seasons' records will be helpful while probably four years' records will pretty surely indicate the habit of production of a particular tree.

The point which we want to emphasize in this connection is that tree records should be begun now. Do not wait. In order to get reliable records several successive seasons' records will have to be obtained. To secure these it is necessary to make a beginning. The only way to accomplish a thing is to make a start. As a matter of valuable public service for the avocado industry as a whole, as well as for private information, there is no more practical or important work than that of securing adequate individual tree records from which safe conclusions can be drawn as to the variety, strain and individual tree behavior.

Other factors besides the number and weight of fruits produced each year which may properly be included in avocado performance records are the chemical composition of typical fruits, the proportion of seed to flesh, the color of the flesh and the rind, the thickness and other conditions of the rind, the description of any weakness in the tree or its fruit, the description of any blemishes occurring in the rind, in the flesh or other part of the fruit, or the tree, the effect of extremes of heat and cold on the tree, its blossoms or its fruit; the effect of drought or excess of soil moisture, the effect of fertilizers, the effect of wind, the appearance of any disease or insect pest and any other illuminating information which will likely prove to be helpful in the consideration of the variety, strain or individual tree.

Another related matter in this connection and one upon which more information is needed is the behavior of the fruits after picking. The stage of ripeness for picking in order to secure the best results in marketing is important. Both the stage of ripeness when picked and the factors taken into consideration when picking and the keeping qualities of the fruits are more or less unknown at this time as I understand it. Therefore, notes on the color and softness of the fruits or other conditions leading to the actual picking, the changes that take place during subsequent holding in storage and the conditions of storage may prove to be of

great value in the successful marketing of the future commercial crops. It seems to me that there is something of a relation, in this problem, to the picking of Bartlett pears and their ripening during packing, shipment, storage, and display for sale. Or, perhaps, a more nearly related condition occurs in the picking and handling of other crops, as, for example, the cantaloupe. In any event I have confidence that the problems connected with the picking, handling, and marketing of the avocado will be solved as they have been for other fruit crops. If information in regard to these matters is collected as the industry grows it seems logical that the problems can be more easily met as they arise than if pains are not taken to secure such information.

Another point which occurs to me is that a sharp lookout should be maintained as to the variability of the fruits on the same tree. Any tendency to variability of fruits in size, shape or other characteristics should be recorded in the performance record notes. This information may prove of value in determining the kind of bud wood best adapted for propagation. It may also assist in avoiding the propagation of ever-sporting varieties or strains. In other words it may be of great value in working out improved methods of propagation.

It seems, from other related experience, that regular bearing varieties and strains are to be preferred to alternate or irregular bearing ones. While this condition is likely to be influenced in a great degree by climatic conditions such as extremes of temperature or humidity, and by cultural practices such as fertilization, cultivation, pruning and thinning, it is also probable that the tendencies of regular bearing and of irregular bearing are more or less inherent. If this is the case then performance records may prove to be very useful in the selection for propagation of regular bearing strains or those having a tendency to produce moderate crops regularly each normal year instead of large crops one year and small crops the following season.

SELECTION OF PARENT TREES

The selection of parent trees as sources of bud wood for propagation should be based, if possible, upon adequate performance records and with that intimate tree knowledge gained through the systematic study of the tree and its fruits. In the early stages of an industry, where no such information is available, there is usually little selection of parent trees as there are few trees from which to select. There are now large numbers of avocado trees of many varieties coming into fruiting in California. If adequate individual tree records are secured from this time on the selection of parent trees for propagation can be made intelligently and more safely than where such work is left to individual recollections which are very uncertain at best, and to impressions which are likely to be affected more or less by personal bias or prejudice. Furthermore, parent trees are likely to be selected on the basis of some one season's behavior, as when the trees have a large crop, then the next season will show these trees to be almost barren. I maintain that performance records are the best means for studying the relative behavior of trees and of their comparative value for commercial propagation. In the experimental stage it is usually desirable to propagate almost everything available. When the propagations come to be used commercially it is important that only those varieties and strains be propagated which will meet the test of climatic, soil, cultural, and marketing conditions. The elements of success in avocado growing commercially will include regular production of crops which can be picked, handled, packed, shipped, distributed, marketed, and reach the consumer in good eating condition. The varieties adapted for this purpose, the best methods for their culture, the location of the orchards, and all other conditions favorable for

this development will be more rapidly ascertained by securing and utilizing adequate individual tree records than by any other means with which I am familiar.

PROPAGATION OF SUPERIOR VARIETIES

The selection of varieties for commercial planting will depend upon many considerations amongst which the following may be mentioned. These conditions are not stated in the order of their relative importance but rather in the way they occur to the writer.

(1) Quantity of fruit. Other things being equal a regular heavy production of fruit is of primary importance.

(2) Season of ripening. While I do not know that any one season is better than another for the marketing of avocados at the present time yet it seems likely that such will eventually prove to be the case. My reason for believing this is based upon experience with other crops. For example, the California grapefruit crops can only be marketed successfully in the East by avoiding competition with the Florida crop and by keeping out of the market largely during the cantaloupe season. As with the grapefruit, California avocados are bound to compete with the Florida avocados and are also likely to compete at some season with other crops used for the same purpose.

(3) The size of fruits. The best commercial size of avocados has not been determined so far as I know. Up to this time the larger sized individual fruits seem to bring the most money. With other crops such as oranges, grapefruit, lemons, and potatoes the medium sized fruits seem to be the most valuable for commercial marketing. Extremely large as well as very small fruits in these crops are likely to be discounted in the market if offered in any considerable quantity. With the avocado, however, some factors may be involved which will prove that the avocado is an exception to this rule. However, it seems likely that when commercial crops of avocados are produced in large quantities the fruits of medium size will prove to be the most easily sold. If so this consideration should be given careful thought by those preparing to set out commercial orchards.

(4) The appearance of the fruits. The outside or external appearance, as well as the inside of the fruit are important considerations in marketing most food products. A distinctive appearance of the fruit should be a valuable characteristic of an avocado variety. The navel is a valuable factor in marketing the Washington navel orange crop. The bright red color of the fruits of several apple and peach varieties is an invaluable asset in marketing these crops. It may be that a striking and distinctive appearance of avocado fruits may prove to be an important factor in establishing and maintaining a market for such fruits.

(5) Eating quality. It has often occurred to me that the food value of the avocado has not been fully emphasized from the standpoint of marketing the fruits. I do not know of anyone having questioned the food value of this fruit, but the facts, as to its high food value, are not generally known. But food value alone does not as a rule market the crops. People usually buy fruit because they like to eat it, although I think that there is an increasing consideration of food values since the war. In other words, fruit usually sells because of its eating quality. Fortunately the avocado combines both eating quality and food value. Personally, I eat avocados because I like them, crave them, and if available I would eat them regularly. On the other hand I liked them and purchased them whenever possible long before I knew that they had any food value.

(6) Shipping quality. Different avocado varieties produce fruit having different texture of rind and flesh. Some are better adapted for packing and shipping to market than others. If a variety of avocados is grown for the pur-

pose of marketing the crops, this shipping quality should be taken into consideration. The fruits of a variety may be admirably adapted for home use or for even local markets but will not make a good standard pack or hold up in good condition where the fruits are shipped to distant markets.

(7) I do not know whether any information is available as to the comparative keeping qualities of the fruits of different avocado varieties. That such differences do exist there is not much doubt. A variety which produces crops that can be held in storage or under other conditions for a considerable period after picking is one meriting consideration. I think that one of the difficulties found in trying to introduce West Indian grown avocados in Eastern markets has been the poor keeping quality of some of the fruit; at least this is what several fruit dealers in New York, New Haven, Hartford and Boston have told me.

(8) Shape of Fruits. In the citrus, fruits having a certain shape make a better commercial pack than others. This condition may or may not hold true for the avocado. It seems likely to me that it may. Therefore, other things being equal, the shape of the avocado best adapted for making a good standard commercial pack may prove to be an important factor in selecting the variety for planting in orchard form.

EXAMPLE OF AVOCADO PERFORMANCE RECORDS

I have secured from several avocado growers the individual tree records which they have been keeping. The data in these records are frequently incomplete from my point of view. It is with the hope of stimulating more complete records and encouraging greater attention toward this subject that I am presenting these data and suggestions as to their improvement from the standpoint of securing adequate data from which safe conclusions can be drawn as to the selection of varieties, strains, and individual parent trees for propagation.

Several years ago the California Fruit Growers' Exchange, a cooperative organization of about 10,000 citrus growers, established a department of bud selection. This department has been self-supporting through the sale of selected buds from its beginning. Last year 230,000 buds selected from superior parent citrus trees were sold to propagators. These buds were sold for five cents each to members of the Exchange and six cents each to others. An experimental nursery has been established in Lamanda Park for testing stocks, buds and methods of budding. The fall season of budding for this year has just begun and more buds have been ordered than were sold during all of last year. As the spring season is the popular budding time for the citrus it seems likely that this department will sell about a half-million buds. More than a hundred bushels of citrus seed was planted for stocks last spring and we anticipate a demand for more than a million selected citrus buds next year.

Is it not possible that some similar organization may become advisable and necessary for the avocado industry?

Minutes of the Fifth Annual Meeting of the California Avocado Association, held in the Auditorium of the Y. M. C. A., Los Angeles, California, May 7th and 8th, 1920.

WM. H. SALLMON	President
J. M. ELLIOTT	Vice-President
W. L. HARDIN	Secretary and Treasurer

FRIDAY AFTERNOON—BUSINESS SESSION.

The meeting was called to order by President Sallmon.

The minutes of the Annual Meeting in Pasadena on May 9th and 10th, 1919, were read and approved.

The report of the Treasurer showed a balance in the bank on April 30th, 1920, of \$1,582.76, and resources amounting to \$2,182.75. The complete report is attached to these minutes.

The Secretary reported that 110 new members had been elected during the year, making a total of 301 active members and eight honorary members.

Chas. D. Adams read the report of the Committee on Varieties. The report was discussed very fully by various members.

It was moved and seconded that the report be adopted. Motion carried.

The election of three directors was then taken up. The following nominees were voted on: Messrs. Jamieson, Teague, Hertrich, Mather, Barber and Adams.

The tellers reported that Messrs. Teague, Jamieson and Adams were elected.

Mr. Barber then made a full presentation of the proposition to establish a department for the selection of budwood and the keeping of individual tree records. He called attention to the importance of establishing such a department, gave an estimate of the cost of operation, and stated that R. M. Teague had made a generous offer to the Association of \$500 in cash toward the salary necessary to carry on the work.

He then called attention to the fact that the Directors had passed a resolution recommending that such a department be established in connection with the Secretary's office.

Mr. Barber then moved that the Board of Directors be instructed to accept the generous offer of \$500 from R. M. Teague for the partial salary of some suitable person to take charge of a budwood department for the Association, and that the Board be further instructed to employ such person for the work and establish the department at once, so that the benefit of such work would be of immediate use to all avocado growers. The motion was seconded, and after considerable discussion was carried unanimously.

The proposition to merge the fall meetings of the Association with the meetings of the California Fruit Growers, was presented by President Sallmon. He reported that the Directors had passed a resolution recommending that the Association appoint a committee of three to attend the next meeting of the California Fruit Growers and report on the advisability of merging these meetings. After considerable discussion relative to the various organizations with which the fall meetings might be merged, the whole matter was referred back to the Directors with power to act.

President Sallmon reported that the directors had assumed obligations for the purchase of fruit for analysis by the Government laboratory in Los Angeles for the purpose of determining the date of maturity of certain varieties of avocados.

It was moved and seconded that the Association approve the action of the Directors in purchasing fruit for such purposes, motion carried.

The subject of stealing fruit was discussed by various members, but no action was taken.

Messrs. Shedden and Sharpless were appointed committee on resolutions.

FRIDAY EVENING.

The informal dinner at the City Club on Friday evening was attended by 230 and some were turned away for lack of room.

After the dinner President Sallmon proposed a toast to the health of the President of the United States to which the members and guests readily responded.

The following program was then presented:

WHY A PHYSICIAN AND SURGEON SHOULD BE INTERESTED IN THE AVOCADO INDUSTRY, Dr. Andrew S. Lobingier, Los Angeles.

WHY A MINISTER SHOULD BE INTERESTED IN THE AVOCADO INDUSTRY, Rev. Dana W. Bartlett, Beverly Hills.

WHY A DENTIST SHOULD BE INTERESTED IN THE AVOCADO INDUSTRY, Dr. H. S. Miles, Alhambra.

WHY A LAWYER SHOULD BE INTERESTED IN THE AVOCADO INDUSTRY, Geo. H. Woodruff, Lamanda Park.

WHY A MERCHANT SHOULD BE INTERESTED IN THE AVOCADO INDUSTRY, J. T. Fitzgerald, Los Angeles.

The addresses were most interesting, and were well received by the audience. President Sallmon presided in his usual happy manner.

SATURDAY, 10 A. M.

PRESIDENTIAL ADDRESS, Wm. H. Sallmon, Chula Vista.

SELECTION OF BUDWOOD—THE IMPORTANCE OF HAVING A DEPARTMENT FOR SUCH WORK, C. S. Milliken, of the California Fruit Growers Exchange, Los Angeles.

MATURITY WORK ON AVOCADOS, E. M. Chace, Director Citrus By-Products Laboratory, Los Angeles.

PROPAGATION OF NURSERY STOCK—THE SUCCESSES AND FAILURES OF THE NURSERYMEN, Robt. J. Mather, Pasadena.

MARKETING AVOCADOS, A. F. Yaggy, Santa Barbara.

SATURDAY, 2 P. M.

At this session Vice-President Elliott presided.

Announcement was made that A. R. Rideout of Whittier had offered a prize of ten first class avocado trees of standard varieties from his nursery stock, to the person securing the largest number of new members during the time from the close of the annual meeting in 1920 to the close of the annual meeting in 1921.

The following program was then presented.

THE WORK OF THE CALIFORNIA NURSERYMEN'S BUD SELECTION ASSOCIATION, Prof. L. B. Scott, San Jose.

REPORT OF COMMITTEE ON VARIETIES, Chas. D. Adams, Upland.

INSECT PESTS OF THE AVOCADO IN FLORIDA, AND INSECTICIDES West Palm Beach, Florida.

INSECT PESTS OF THE AVOCADO IN FLORIDA; AND INSECTICIDES WHICH MAY BE USED WITHOUT INJURY TO THE TREE AND FRUIT, G. F. Moznette, U. S. Department of Agriculture, Miami, Florida.

FINANCIAL STATEMENT CALIFORNIA AVOCADO ASSOCIATION

April 30, 1920.

Cash on hand April 30, 1919.....\$ 808.14

Receipts April 30, 1919 to April 30, 1920:

Annual Dues, 1919.....\$ 420.00

Annual Dues, 1920.....1,055.28

Annual Dues, 1921.....5.00

Advertising, 1918-1919 report.....217.50

Sale of annual reports.....18.00

Donation—A. R. Rideout.....10.00

Total Receipts.....\$1,725.78 1,725.78

Total Cash and Receipts.....\$2,533.92

Expenditures, April 30, 1919 to April 30, 1920:

First National Bank, account unpaid checks.....\$ 10.00

Subscription to Citrograph.....1.00

Printing and Stationery.....477.28

Stamps.....69.99

Clerical work.....300.00

Expense Annual Meeting, Pasadena.....16.50

Expense Directors' Meeting.....2.50

Telephone and Telegraph.....5.69

Fruit for Dinner, Santa Barbara Meeting.....40.25

Operation of Lantern, Santa Barbara Meeting.....5.00

Printing large cards, Santa Barbara Meeting.....6.00

Advertising, Santa Barbara Meeting.....6.90

Photo of curly root.....1.55

Transfer charges.....3.50

Fruit for committee on varieties.....5.00

Total Expenditures.....\$ 951.16 951.16

Balance on hand, April 30, 1920.....\$1,582.76

Resources, April 30, 1920:

Cash in bank.....\$1,582.76

Unpaid Dues, 1919.....115.00

Unpaid Dues, 1920.....400.00

One filing case.....35.00

Unused circulars and stickers.....50.00

Total Resources.....\$2,182.76

Liabilities, April 30, 1920:

Bills payable.....65.95

\$2,116.81

W. L. HARDIN, Treasurer.

Annual reports on hand, April 30, 1920:

1915.....	156
1916.....	30
1917.....	121
1918 and 1919.....	209
Total.....	516

STATEMENT OF MEMBERSHIP
CALIFORNIA AVOCADO ASSOCIATION

April 30, 1920.

Total Membership with dues paid to Jan. 1, 1919, as reported April 30, 1919	191
New Members elected during present fiscal year.....	110
Total Active Membership.....	301
Honorary Members	8
Total Membership	309

W. L. HARDIN, Secretary.

After reading the report of the committee on varieties, the Secretary was instructed to secure advice on the legality of changing the name Dickey A. to Habersham.

S. W. Funk spoke on top-working by grafting.

Vice-President Elliott paid an eloquent tribute to the very able and conscientious service which President Sallmon had given to the Association during the last two years.

The Secretary supplemented these remarks, and also called attention to the willing response of Vice-President Elliott to the many duties which he was called upon to perform for the Association.

Many growers took part in the exhibit of fruit which was a pronounced success in every way. Twenty-seven varieties were exhibited.

The Committee on Resolutions reported as follows:

Of old it has been said: "It is a good thing to give thanks." The youthful California Avocado Association has always expressed appreciation for help and favors received. It has prospered, wonderfully, and we continue to give thanks:

1st. To the Young Men's Christian Association for the free use of its auditorium and other accommodations for our meetings and exhibit.

2nd. To the public press of Los Angeles and Southern California, and to the Horticultural publications, for their helpful publicity.

3rd. To the instructive and entertaining speakers, and to the gentlemen of science who continue to share with us their wisdom in the way of the avocado; all of whom have contributed to the pleasure, as well as profit, of our meetings.

4th. To those indefatigable growers whose exhibition of the glorious fruit, in its still expanding beauty, has brought joyous encouragement to the hearts of all those who are putting forth an earnest effort to obtain this great boon for their fellowman.

5th. To Mr. Rideout for his generous presentation of valuable trees as incentive for increasing the membership of the Association, and for his donation of fruit for the annual dinner.

6th. To Mr. and Mrs. Jamieson who have so carefully handled the valuable display of fruit.

7th. To the retiring Directors who have so well and generously served the interests of the Association.

8th. To the retiring Secretary-Treasurer whose constancy and intelligent devotion to duty prompts us to whole-heartedly exclaim: "Well done thou good and faithful"—Hardin!

THOS. H. SHEDDEN,
B. H. SHARPLESS.

On motion the meeting was adjourned.

W. L. HARDIN, Secretary.

PRESIDENT'S ADDRESS

PRESIDENT WM. H. SALLMON, CHULA VISTA, CALIF.

Ladies and Gentlemen:

In opening this fifth annual meeting of the California Avocado Association, it is a satisfaction to be able to state that our affairs are in a sound condition and we are on a firm foundation. We do not have to face the specter of a debt for more than 100 new members have been added during the year, making a gain of about \$500 in our net resources and with all bills paid, we have in the bank a comfortable balance of more than \$1,500. The receipts for the year were \$1,725.78, and the disbursements, \$961.16. It is well known to the leaders, and should be known by all our members, that these results are chiefly due to the untiring work of Dr. Hardin. In spite of health conditions which would have caused many men to seek absolute rest, he has carried the burdens of the combined office of Secretary and Treasurer with devotion and has exhibited qualities of business efficiency which have been an inspiration to us all. He has prepared the minutes of all meetings of directors and members, has carried on a large correspondence, increasing in volume, has collected the material for the annual report, has received and disbursed our funds, has supervised the printing of 7,500 circulars and notices during the year, and 100,000 additional copies of that neat sticker, "Eat Avocados," which was his own thought and design. His duties have been so manifold and the welfare of our industry so consistently in his heart, that he calls to mind the words of the great apostle, who after recounting his labors added, "Besides the things that I omit, things that come out of course, there is that which presseth upon me daily, anxiety for all the churches." We face with dismay the fact that Dr. Hardin feels obliged to retire from these duties, but we hope to retain his wise counsel as a director, at least until his term expires in 1922, and we hope that before that time he may again become a grower of avocados and so realize in his own experience some of those fine ideals which he uttered at our annual dinner in Pasadena a year ago.

The directors entrusted with the affairs of this Association during the past year were Chas. D. Adams, of Upland; T. U. Barber, of Puente; H. J. Webber, of Berkeley, term expiring in 1920; J. M. Elliott, of Los Angeles; Lester Keller, of Yorba Linda; Wm. H. Sallmon, of Chula Vista, term expiring in 1921; W. L. Hardin and Mrs. J. T. Stewart, of Los Angeles; A. F. Yaggy, of Santa Barbara, term expiring in 1922. The board has held six meetings and four members have a clean record for attendance at all of them, two missed only one meeting. The officers of the previous year were re-elected by unanimous vote, and the president presented to the board a proposed program of activities, outlining some of the things to be aimed at in 1919-20, as follows:

AVOCADO PROGRAM—1919-20

Some of the things to be aimed at:

1. Increase Membership to 300.
2. Study marketing problems,
 - (1) Steps to assist members in sale of fruit.
 - (2) Steps toward elimination of marketing unfit fruit.
 - (3) Study how to pack for shipment.
 - (4) Standardize sale prices of varieties.
3. Continue study of varieties.
4. Co-operation of Rockefeller Institute in investigating uses of avocado for medicinal purposes.
5. Extend Educational Campaign,
 - (1) Leaflet on "Avocado as Food."
 - (2) Leaflet on "How to Select a Good Avocado and Prepare for the Table."
 - (3) Prepared articles in press.
 - (4) Reprint, "The Avocado From Seed-time to Harvest."
6. Directors' Field Day for visits to groves.
7. Exhibit of Fruit at best season.
8. Encourage keeping of individual tree records.
9. Steps toward securing qualified man for sub-tropical fruit investigations.

It will be interesting to the members to hear what has been accomplished in some of these directions.

1. *Membership*: With a membership of 161 two years ago and 216 last year, it was felt that we might reasonably seek to attain the 300 mark this year. And it is a pleasure to report that we attained it. There are now enrolled 301 bona fide members in addition to 8 honorary members. This increase of new members for the year, breaks all our previous records. Most of the additions are secured by the work of the Secretary through correspondence, and by appeals at the semi-annual meetings. Other methods suggestive of the "campaign" or "drive," have been tried from time to time, but with little or no success. The Secretary is the mainspring in this matter because his position is constantly giving him the opportunity to present personal invitations to unite with the Association. In my judgment no secretary should be retained in office who will let the paying membership fall below the 300 mark now set, for the Association depends for its financial support almost entirely upon the income from memberships. And we should not delude ourselves by allowing inviting propositions to lead us into spending more than our income in the vain hope of securing much more money thru additional memberships, for the constituency upon which we have to draw is limited and is likely to remain so.

2. *Marketing Problems*: Your directors have discussed the marketing of unfit fruit which has been brought to their attention. The abuse consists in dumping upon the market quantities of fruit blown down by the wind and in offering green fruit for sale. These appear to be individual matters which will be regulated by conscience and the laws of business, and eventually, when the supply of

fruits warrants it, by government regulation. Not all windfalls turn out badly. Many of them mature properly, according to the testimony submitted at the meetings last year. But the percentage which withers or decays or is tasteless, is what harms the industry. Therefore windfalls, if marketed, should be sold as such and not be presented to the public as normal fruit. The problem of when to pick is more difficult. The writer of an article published last week, who states that for the past nine years he has been studying the avocado under local conditions, says, "One great fault at present is that fruits are picked while immature, taste like raw pumpkin, 'and one dose is enough.' We have found that they should be picked similarly to a pear, and also handled in a similar manner. The bud end becomes a trifle soft, and when the fruit is taken and gently lifted, if ready to pick, it loosens at the stem end, similar to a Bartlett pear. Then if left a few days to mellow it is ready for market." This sounds as if the gentleman has had experience, chiefly with Mexican varieties, for the case is not quite so simple with the Guatemalan varieties. Nature has provided a sure sign of ripening for such fruits as the Spinks, Dickinson, Sharpless and Puebla, which turn from green to purple and maroon, but it is not always possible to tell when fruits which mature green like the Taft, Fuerte, Blakeman, Lyon and Perfecto are ready to pick. The grower who is shipping his fruit some distance so that it is a week or more in transit cannot take the risk of waiting until the fruit is mellow. He must ship it in firm condition. Moreover, in shipping short distances it is not practicable to ship mellow fruit because some days may pass before the dealer effects a sale. Growers are not, therefore, to be accused lightly of shipping unripe or immature fruit.

Some action should soon be taken to assist members of the Association in the sale of their fruit. Growers here and there, who are favorably situated or who have established a reputation have no difficulty in disposing of the crops they raise at present to hotels and clubs, but we hear frequently of those who cannot market what they raise. The only feasible plan suggested thus far to meet this situation is to establish a selling agency in Los Angeles to handle fruit from our members on a commission basis. This may lead to the standardizing of prices per dozen for the approved varieties or to selling by the pound.

The adoption of a standard type of carrier to use in shipping California avocados has been urged upon the Association by Mr. L. B. Scott, who advocates the six basket crate as used by the growers in Florida. Reference to this standard carrier was made by Mr. George S. McClure in his article entitled, "What About the Avocado," printed in our annual report for 1918-19. The reasons advanced for adopting the six-basket crate are that it is known on the market and would, therefore, receive better consideration from the trade. It is also used for shipping tomatoes, peaches, plums, peppers, okra, persimmons and guavas and, therefore, there should not be much difficulty in obtaining shooks when shipments from California warrant the purchase of crate material in large quantities. In some of the Florida shipments the baskets are not used, the fruits being packed in the crates in excelsior. Mr. Scott points out, however, that the use of the baskets would be advisable in many cases as the original package could then be broken up and sold to several retailers. This in the case of avocados would be especially desirable in certain markets where the demand of any retailer in a single day might not amount to more than a few fruits. We have been informed that the Climax Basket, such as used in Florida, is not manufactured on this coast. The basket made here is known as a five-pound basket and crates are made to hold four of these baskets. I have had a sample made of

the six basket crate according to the dimensions given in Specifications for Container for Fruits and Vegetables and Loading Rules of the United States Railroad Administration, also of the four basket crate, largely used in this State, and have placed them in the Exhibit for your inspection. We have also placed in the Exhibit samples of small crates as made by Mr. B. H. Sharpless, Santa Ana. Now is the time to take action upon the adoption of a standard carrier when the avocado production in California is relatively light.

3. *Study of Varieties:* The Committee on Classification of Varieties has met on the third Tuesday of each month to consider the merits of new varieties of avocados, and also to consider any additional data relative to any of the eight varieties already recommended. The work has been done chiefly by Messrs. Adams, Barber and Hertrich, the other members of the Committee, Messrs. Kinman, Scott, Shamel and Webber, having been so situated that they could not render much effective assistance. The report of the Committee, submitted to the members of the Association at the annual business meeting yesterday will be read this afternoon for your information.

4. *The Avocado for Medicinal Purposes:* The proposal to enlist the cooperation of the Rockefeller Institute in investigating uses of the avocado for medicinal purposes was prevented by effects of the war. Meanwhile it has become likely that the men and equipment for such research work may be provided in our own state. That the avocado has such uses is indicated by the following testimony from one of our members, "For 35 years, I had been a chronic dyspeptic and up to the time I began eating avocados, I had about made up my mind that there was nothing I could eat without distress. Life was hardly worth while. But, sincerely speaking, I have found in the fruit a substitute for meat and eggs that I relish much more and that agrees with me to such an extent that no other rich foods ever did."

5. *Educational Campaign:* Mr. Elliott's address on "Utility and Sentiment applied to Avocado," and Dr. Hardin's address on "Influence of the Avocado Industry on the Individual and the Community," have been reprinted and used in securing new members. The proposed leaflet on "The Avocado as Food," has been postponed until some reliable information can be obtained relative to the use of Avocados as a food for convalescents, and also as a food in the case of certain diseases. "How to Select a Good Avocado and Prepare for the Table," has also been postponed. Mr. Barber's address on "The Avocado from Seed-time to Harvest" is being brought down to date for publication. Several of the directors and members have prepared signed articles for the press, giving the results of experiment and experience and thus helping to counteract some of the misleading information which finds its way into public print.

Another educational feature worthy of note is an arrangement with the Citrus By-Products Laboratory in Los Angeles, by which all the fruit on one tree of each of the recommended varieties is secured to them for experimental purposes. This Association provides four trees and the U. S. Department of Agriculture provides four. In due time Professor Chace, director of the Laboratory, will give us the benefit of this research work which may lead towards a maturity standard for the avocado.

6. *Visits to Groves:* The directors at their own expense of time and money, have devoted a number of days to visiting avocado plantings. The ground covered included the San Fernando Valley, the Whittier district, the Foothill

Boulevard, the Yorba Linda district and the Santa Ana district. The Committee on varieties also spent a day in the San Diego district. The opportunities for observation of the trees and the different methods of handling them and the comparison of notes with the growers were most valuable. Information gained in this way at first-hand, is extremely valuable to the leaders of an industry.

This recital will show the value in business of having a well defined program for a year's activities made out with as much care as a financial budget. We had something definite to aim at, and in reviewing the year's record we find that definite progress has been made. The projects of employing a Secretary on full time and of establishing a department of budwood selection, which will also involve the keeping of individual tree records, are advanced steps which promise intelligent development.

Our industry is still in the experimental stage and we have many unsolved problems to face. We have learned that the business of growing avocados is expensive and risky. While a good orange or lemon tree can be bought for 75 cents or a dollar, budded avocado nursery stock costs from \$3.50 to \$10.00 each, according to variety. It is an expensive business to start and also, an expensive business to maintain, for the avocado tree demands more watchful care and constant attention than the citrus tree. The business is risky because our experience in the culture of the avocado is limited, because much of the nursery stock grown in boxes and cans develops curled roots which result in weak and useless trees, because the tree is sensitive to wind, and to extremes of heat and cold and the location or the nature of the soil in which it is planted may not meet its requirements. Some varieties will thrive in one locality and others in another and the experiment of discovering the varieties adapted to each locality is costly. Prices for the fruit are high for this reason, and for the further reason, that the supply does not equal the demand. The Mexican varieties sold for \$1.50 to \$3.00 per dozen during the past winter, and the Guatemalan varieties are now bringing from \$5.00 to \$12.00, and even \$15.00 per dozen for very choice specimens. The fruit retails on the Los Angeles market from 75 cents to \$2.00 each. The retailer is the profiteer. The grower who bears the heavy expense of labor and who takes the risk of the business is receiving a comparatively high price for his product, but very few growers market enough to show any margin of profit. There are probably about 650 to 700 acres planted to avocados in California. With these and additional acreage in full bearing and with the accumulation of knowledge about the tree and its habits, which is one of the chief objects of this association, the prices will come down, and this "natural mayonnaise," which has a higher food value than any other known fruit, will become more generally available.

MATURITY WORK ON AVOCADOS

E. M. CHACE, LOS ANGELES, CALIF.

Mr. Chairman, friends and fellow members of the Avocado Association:

I have been requested to present for your consideration this morning some phases of one of the problems confronting the avocado grower, "The Maturity Problem." Briefly stated, this problem consists in arriving at the time in the growth of the avocado when it can be harvested with best results, both as to storage and to quality. There is a period in the development of all fruits when they can be harvested with optimum results. The problem is to find this period.

One of the first points to be considered is what constitutes maturity. The question may be considered from two points of view: firstly, as to commercial maturity; secondly, as to natural maturity. A definition of the first class may possibly be arrived at, but I know of no one who will hazard a definition to cover maturity as conceived by nature. At first thought, we might suggest that when the seed within the fruit has advanced sufficiently to sprout and reproduce the plant, that the fruit is naturally mature; but it is notoriously the fact that seeds from green fruit will sprout and reproduce. On the other hand, if we await the time when the seed has sprouted within the fruit, we have usually waited until the latter has passed the period where its best eating quality is found. Natural and commercial maturity cannot be correlated, for manifestly many things are sold and eaten before they are naturally mature. Commercial maturity may be said to be that stage of growth at which the fruit may be harvested with equal satisfaction to the producer and the consumer alike. The producer ever seeks to put his product on the market physically sound, while the wise consumer ever seeks fruit that has developed its full size and flavor. There is no definite natural point at which one can say a fruit is commercially mature. Some persons of peculiar tastes will enjoy fruit which is much too acid for the average consumer, and some will not care for it until it is so far advanced as to seem insipid to the great majority. After giving the matter considerable thought for several years, I have come to the conclusion that the only reasonable way to handle the question is to set a purely arbitrary standard which should be as low as good marketing practice will permit. This, it is true, will not place before the public a product of which the great majority of growers should feel proud. The standard must be high enough so that the fruit on reaching the market will not turn the majority of the buying public against the crop as a whole. Any standard which will not accomplish that is worse than useless. This, of course, is not satisfactory to the market hog, who would dispose of his crop at the greatest profit to himself alone and let the other growers look out for themselves. Nor is it entirely satisfactory to the idealist who would make it much more severe. The former, however, is a public nuisance which should be abated, and the latter has his remedy in his private brands where he can regulate the quality of his output to his own satisfaction.

Some fruits undoubtedly develop the best eating quality when left to mature upon the plant, but this is not the case with all fruit. Certain varieties of apples and pears are always harvested before maturity in order to develop their maximum flavor, and in some cases several weeks of storage are necessary. Bananas, for instance, are harvested green in the tropics, even when they are intended for local use, and are said to develop a better flavor thus than when left on the plant to mature. It must be confessed, however, that the depredations of birds and insects upon the maturing fruit have had no little part in bringing about this custom.

The above mentioned fruits increase their sugar content after removal from the tree, as they have stored within the fruit material from which sugar is produced. Other types of fruits, however, do not materially increase their sugar content after harvesting. In our experimental work with citrus fruits we have failed to find evidence of any increase in sugar content after the fruit is removed from the tree. There is, however, a decided decrease in the acid content, which is sometimes mistaken for an increase in sweetness.

It is apparent then, that some fruits may be harvested some little time before they are ready to eat, while others should be left upon the plant as long as possible.

In the case of the avocado, the flesh contains no starch from which sugar can be produced after harvesting; indeed, sugar plays no appreciable part in the composition of its flesh, and in all probability gives no indication of maturity. In fact, so far as the limited data on hand go, they show less sugar by far in the matured fruit than in the green. Apparently also the sugar decreases after the fruit is removed from the tree.

We must, therefore, turn to other constituents to determine the maturity of the fruit, and naturally the oil content presents the best indication of success. From what the oil content of the avocado is derived, I cannot say at this time. I can say that in all the varieties examined by us the oil content increases as the avocado matures. The actual amount of oil in some varieties increases to a slight extent after the fruit is removed from the tree. With varieties that are now mature, there has been an increase of nearly 400% in the oil content since we began the analysis in September.

If the oil content is the best indication of the maturity of the fruit, the question at once arises as to the practicability of such a standard to the grower. Manifestly one of two things must be accomplished in order to make it possible for him to utilize the information. Either a simple method for the determination of oil must be devised or the oil content must be correlated with some physical characteristic of the fruit which can be readily distinguished. Fortunately both methods seem possible of accomplishment. It does not seem at all difficult to adopt the Babcock test, used for fat determinations on milk, to properly prepared avocado pulp. Also there are certain characteristics developed by the fruit as it matures which it may be possible to utilize as an indication of maturity. At the present price of avocados, the oil determination method, it is believed, will not become popular, for manifestly the fruit will have to be destroyed for the test, so that we are concentrating on the study of the correlation method.

With many fruits, it is easily possible to predict maturity from the physical characteristics of the fruit. Usually color is thought to be the first evidence of ripening, and often is. But it is also true that some fruits color before they become palatable. Next to color, the "feel" of the fruit is most often used; not many fruits can be left on the tree, however, long enough to become soft, as the shipping quality would be lost. The color of the stem is also an indication of maturity. With some fruits the color and condition of the seed or seeds is sometimes used. In the case of Bartlett pears, the color of the seed is taken by many growers as an indication of ripening, and also the ease with which the stem can be broken from the branch.

One naturally looks to the seed as a good indication of maturity, but this examination is not available in the case of the avocado at present, as the fruit is too expensive. We have been observing carefully the appearance of the seed as the fruit grows, and there is a marked change, but the only indication given from the outside is the loosening of the seed in its cavity and when this stage is reached, the fruit of some strains at least is over ripe. Advanced maturity is often indicated by the facility with which fruit separates from the twig, but too often this takes place only after it is too ripe for commercial use. The avocado separates naturally from the fruit spur in two places, one at the junction of the fruit and its stem, the other at the point where the fruit stem is attached to the parent plant. In our experience, many strains of avocados are mature enough to store before they will separate readily at either point. So far, the physical characteristics which seem to us to give the best indication of maturity are the color of the fruit and of the stem.

In conclusion, a word about the work which we are doing and plan to do in the future will not be amiss. This year the maturity work has been confined to the eight varieties recommended by the Association as the standard fruits for commercial growing, namely, Blakeman, Dickinson, Fuerte, Lyon, Puebla, Sharpless, Spinks and Taft. Of these the Puebla and Fuerte are finished. Owing to unforeseen difficulties, the work on the Puebla was not started until rather late for this variety, and the wind storm of last November shook a great many fruits from the tree, so that the results in this case will be somewhat meagre this year. The work on the Fuerte is about over, and a full line of monthly samples, beginning with September, have been finished. Here we were able to secure a tree with ample fruit for analysis, and have been fortunate in having but few drops until late in the season.

The Blakeman tree has not as much fruit as we would like to have, but will be sufficient to furnish valuable data on which to base future work. The Lyon tree was young but was well supplied with fruit and analyses are still being made. The Dickinson tree is also in satisfactory shape and has sufficient fruit to carry the analyses well past the ripening stage. The fruit on the Taft tree we overestimated and drew upon too heavily for the first samples. We have had enough, however, to bring the analyses to date. Work on the Spinks was not begun until after the first of the year, so that we will have ample fruit to satisfy our needs.

This year the plan has been to select typical trees, and begin the analyses several months before there was any question as to the maturity of the variety. We have taken a sample every month, using 6 fruits to a sample where the supply permitted. These samples were divided into two equal parts, the first of which was analyzed immediately, the second wrapped in paper and stored at laboratory temperature until it softened, before analysis was made. The two sets of data thus obtained are calculated to the moisture free basis for comparison, and the changes taking place on storage determined.

This year rather full analyses are being made; if after studying the data obtained, it appears that some of the constituents do not materially change with the maturity of the fruit, we can omit their estimation next year. Mr. Church, who is doing the analytical work this year, is determining the percentage of rind or skin, of seeds and of pulp, the specific gravity of the fruit, the percentages of moisture, mineral matter, oil, and crude fiber in the flesh. Notes are also being taken of the physical characteristics, such as color of the skin and stem (where it is known), "feel" of the fruit, whether it appears leathery or soft, color of flesh, whether flesh separated readily from skin, color, odor and condition of seed. Already I can assure you that you will find these data most interesting, and I believe profitable. One year's work on one tree of each variety will not be sufficient to establish a standard, of course, but it will give us a pretty good idea of the work needed in the future. We would like to extend the collaborative work next year, taking up the composition of the fruit from bud selection trees, and extending the analyses to new varieties which show sufficient promise to warrant the work. A few such analyses have been made this year. There is also much interesting work on the composition of the avocado, and its seed, both of which present a new field of work to the research chemist.

MISCELLANEOUS AVOCADO SAMPLES.

No.	Variety	Date picked 1917	Aver. Wt. oz.	Sp. Gr.	Skin %	Pulp %	Seed %	Water %	Ash %	Protein %	Fat %	Total Sugar %
4.	Lambert.....	3/13	10.2	1.0270	8.8	68.0	22.9	74.6	1.26	2.47	15.21	1.33
6.	Monroe.....	3/29	13.8	.9256	11.6	62.1	26.2	74.9	1.11	2.04	15.89	0.90
8.	Surprise.....	4/11	16.7	.9996	7.7	70.1	22.2	81.3	1.15	2.38	10.07	1.50
9.	Dickey A.....	5/21	17.3	1.0239	8.1	72.4	19.1	73.8	1.26	2.32	11.60	0.31
11.	Challenge.....	7/13	19.8	1.0074	5.4	74.0	20.2	81.4	1.09	3.18	10.90	0.62
13.	Carbou.....	7/17	12.2	1.0360	9.7	65.5	24.6	75.8	1.75	2.92	13.44	0.71
14.	I. X. L.....	7/17	25.8	.9782	11.6	76.3	11.8	78.9	1.54	2.81	12.55	0.41
17.	Murieta Seedling, Buttercup.....	7/24 1919	12.2	1.0280	12.9	62.5	24.2	75.6	1.24	1.93	14.91	0.27
22.	Linda.....	8/22	27.6	.9937	11.3	72.4	15.8	78.9	1.31	1.79	13.36	0.72
30.	Dickey A.....	10/ 3	7.6	.9895	13.3	78.6	8.1	85.4	0.65	1.75	6.37	1.56
33.	Seedless Fuerte.....	10/16 1920	.85	1.0104	10.2	88.1	.....	78.5	1.04	2.36	10.62	1.43
58.	Seedless Guatemalan.....	1/ 7	15.2	.9548	14.7	66.0	19.2	65.9	1.89	1.73	24.89	1.00
64.	Seedless Fuerte.....	1/30	.88	1.0093	13.9	85.3	.....	64.6	1.37	1.71	24.92	0.59
67.	Mexican, No. 15.....	1/30	16.5	.9288	10.7	80.2	9.5	80.3	1.08	1.97	11.51	0.67
73.	Seedling, Dutton.....	2/21	9.2	1.0202	8.9	68.6	22.5	81.2	1.06	2.26	11.09	0.66
94.	Seedling, A. Campbell..	4/18	11.0	.9701	11.3	69.6	18.9	72.2	1.27	2.75	19.26	.....

(From Citrus By-Products Laboratory).

THE PROPAGATION OF NURSERY STOCK—THE FAILURES AND SUCCESSES OF THE NURSERYMEN

ROBERT J. MATHER, PASADENA, CALIF.

Mr. President, Ladies and Gentlemen:

The failures, or in other words, the death of 90 per cent. of nursery stock, so far, have been caused by curly root which is started when the trees are very small, by the seed being sprouted in pots, cans and boxes, and being held in these containers for some 12 to 18 months, before being planted out in the nursery row, and later being sold for field grown stock. Others are held yet longer, being budded in these small wooden boxes and grown large enough to be planted in the orchard. I think after some of you large growers have replaced several thousands of such trees with great loss of time that you will agree with me when I say that any avocado tree that has been confined to a pot, can or box is not fit to be planted. There are yet several large avocado nurserymen growing trees that have either been started in pots or boxes, and I think that it is high time that this Association should instruct all planters to look out for such stock.

Another very great mistake is that of cutting budwood from worthless trees. Nurserymen should cut all budwood themselves, being careful to select good wood from trees that have at least two years performance record.

The success of the avocado nurserymen depends wholly on the manner in which they grow their stock. If they will grow thrifty, clean, straight field-grown stock of proven varieties they will without a question find a ready sale for all their stock.

I will endeavor to tell you how we consider the proper method of propagating such stock. Do not understand by this that I want you to think that this is the only way to grow nursery stock, but the way that we have grown our stock, which I believe will speak for itself. When looking around for seeds we are very careful to select only the very best that we can obtain, using only seeds from the small black and green Mexican varieties, as we have found from experience, that seed used from all thick skin and medium thick skin varieties such as the Harman and Ganter are undesirable, as they make a very slow growth, poor root system and also have a thick bark which is very hard to bud into. Seeds used for nursery stock should never be allowed to dry out after they have been removed from the fruit, but should be at once packed in moist, clean sand, where they will keep well for two to three months. Before they are removed from the sand, soak them well for two to three weeks. Build the beds for planting in a good sunny place above the surface of the ground, using about 12 to 15 inches of good, clean sand. Plant the seed with the top about one-quarter of an inch above the surface. Seed may be planted close together in the beds as they are removed loose rooted. After planting, soak them well and cover them over with a light coat of shavings. Seed under such care, planted in the seed beds in January, will be ready to set out in the nursery row by May or June, when they will be from four to five inches in height and the roots about six to eight inches long. We are careful when transplanting them that the roots are not disturbed any more than possible, as the young roots are very tender. They should be planted 12 to 14 inches apart in the nursery row and the rows three feet apart. Be sure to set the seed down in the ground about one inch from the surface and never break the seed away from the young sprout. Very often more than one sprout starts out from the seed. Never

leave more than one when transplanting to the nursery row. Holes for planting are dug four inches in diameter and plenty deep enough for the roots to be carefully spread out. Do not pack the dirt around but fill in with loose dirt following soon after planting with water to settle the dirt. You will find a regular post-hole digger a fine tool to dig such holes for planting. From the time the trees are set in the nursery row, never allow them to become dry, or the soil to crust around them. Deep furrows are made when irrigating to keep the water from the surface of the ground, which will tend to draw the roots downward. Cultivation should be done as soon after irrigating as possible, keeping up close to the trees, as we believe that good cultivation close to the trees is two-thirds of the growing of nursery stock. This same style of cultivation will apply after they have been set in the orchard. Never be afraid to do too much cultivating as this cannot be over-done. I would not recommend non-cultivation for avocados any more than non-cultivation for citrus trees. They all require air. The amount of water will depend very much upon the kind of soil and drainage. We water our nursery stock every 10 days. Stock planted either in May or June will be, if properly cared for, ready to bud the following March or April as soon as the sap starts.

There comes a time in the growing of nursery stock when the nurserymen should be careful to obtain the very best of budwood. For the past two years we have used only "pedigreed" budwood from orchards that have proven to be valuable fruit producers, and have when possible required a two-year performance record of trees that they are cut from. Some growers have not kept an exact record of their trees, but this should be done if possible on trees that buds are taken from. Mr. Whedon, from whom we obtained our Fuerte buds, has kept a record now for several years. The types of budwood vary a great deal, as one type of buds from one variety will do well while the same type of another will not. Budwood should, if possible, be cut early in the morning when the trees are fresh, being very careful never to cut at one time more buds than can be used in four or five days. We are very careful never to hurry when budding but see that every bud is well inserted and carefully wrapped. Some nurserymen use cotton twine or raffia for wrapping, but we have found that a good prepared waxed cloth has been much more satisfactory, as it seals more closely preventing the air from getting under the bud, which would cause them to dry and turn black. The bud eyes should never be covered over with the wrap, but the balance should be well wrapped and drawn up very tight. After the buds have been in for ten to fourteen days, go over them and if found alive the tops of the trees should be tipped off. After another fourteen days if found alive the seedling stock is cut off about six to eight inches above the bud, allowing no suckers to grow but forcing the bud eye out as fast as possible. As soon as the buds are out from four to eight inches they are at once staked. They are at this time very soft and can be started straight, which cannot be done after they have gone longer. The seedling stalk should be left on until the bud has grown out well, when it is cut off just above the bud and either waxed or painted over. We go over our stock at least twice a month to break off all suckers and to retie.

Balling of trees depends greatly on the size of the seedling stock. Do not make large, loose balls as they only break all the fibrous roots. If you furrow deeply for watering you will find that a ball for yearling trees made from seven to eight inches in diameter and from fourteen to sixteen inches in depth, will be large enough.

All trees after balling should be held under cover for at least ten to fourteen days before they are delivered for orchard planting.

MARKETING AVOCADOS

A. F. YAGGY, SANTA BARBARA, CALIF.

Mr. President, Ladies and Gentlemen:

At a time like this when sugar jumps \$5 a hundred over night and food staples sell at the price of luxuries, it is no wonder that good sized avocados have retailed as high as \$2 each. It is no wonder, either, that certain of our members express the opinion that at the present time the Association need not seriously consider the question of marketing, as the trade is calling for avocados faster than they can supply them.

In former discussions of marketing the grim specter Overproduction haunted the meetings, but as the years roll by the good angel, Increased Demand, has proven more than a match for him, and from the way prices have risen we can all easily believe that it is perfectly possible to send a sky-rocket to the moon. Just when this bubble of wild extravagance will burst and things will settle down to something like real values, no one can say, but whether that time comes in one year or five we can be reasonably sure that things classified as luxuries, such as fruit selling at \$2 a pound, will be the first to go begging. In the meantime, many small plantings and a few larger ones are getting to the productive stage, and nursery stock is in great demand.

Of course the law of supply and demand will regulate the price, as has been pointed out at every meeting of the Association. We know that the supply is bound to increase rapidly and we are all so imbued with the great virtues of this fruit that we believe the public will share our enthusiasm and keep shouting for more, regardless of price. Nevertheless unless we make sure that the demand keeps pace with the supply we shall doubtless arrive at the same unpleasant situation that the orange industry did. Read what Mr. Powell, manager of the California Fruit Growers Exchange said of that time:

"The rapidly increasing crop was left in the hands of individual buyers, the market collapsed because the buyers could not take a risk when the crop was large and the distribution not co-ordinated. The industry's problem was met only when the producers systematized the distribution of their own fruit, eliminated speculation from its purchase and distribution, established their own sales offices, and sold their products to the wholesale trade in the territory where the fruit was to be consumed. * * * The average jobbers' margin on oranges is now less than 10% of the selling price—retailers' about 25%. These trade margins are the lowest of those on any of the fruit crops."

A recent book by a learned man on Organized Methods of Marketing California Horticultural Products says this. "The permanence of horticultural industries depends upon the successful marketing of the products." He says further: "Growers' Co-operative Marketing organizations are capable of:

- "1. Reducing the cost of marketing.
- "2. Improving the distribution of the product.
- "3. Increasing the demand for the product.
- "4. Standardizing the product.
- "5. Protecting the individual grower."

Hence it would appear that to make a successful industry of growing avocados we must have, sooner or later, a marketing organization, and to quote again from Mr. Powell:

"To be permanently successful the organization must be formed by the *growers*, managed by them and the benefits returned to them. None has succeeded in which the growers and the buyer and speculator are joined together, because the interests of the two are not the same."

It is evident that unless we could make some satisfactory arrangement with a distributing organization already established, such as the California Fruit Growers Exchange, that would be willing to introduce, popularize, and market our product we shall have to take prompt and definite steps towards creating a marketing organization of our own. This we can do just as surely as we can determine which varieties are best to grow and how to grow them. In fact it is the next step for us to take—the one that our work so far leads up to.

It has been suggested that, for the present at least, we should select one good jobber in each city where we want to introduce our fruit, give him our support and assurance of the benefits in the future arising from his missionary work, work with him to educate the trade, and advertise to create a demand at times when the crop is heaviest. We would expect him to make a specialty of our avocados, we would get the benefit of his organized sales force, his warehouse, his trucks, and his good will with the trade, etc. This may be our best course for a few years at least, outside the city of Los Angeles. One live commission house in San Francisco writes:

"It is our opinion that it would be the very best policy to select one firm in this market to handle the avocados. We speak of this with the understanding that the Association will very soon take over and regulate distribution. Frankly, we do not believe that the avocado can be properly introduced on a large scale by the individual growers working from their own ideas. The Association could give its instructions to one firm which could be carefully carried out and in turn the firm could give the Association any information from experience with selling the fruit. We are awake to the important position the avocado will soon occupy in California's agricultural world. The mere fact that the limited supply is so readily absorbed at such extremely high prices is proof enough that the avocado will be a very popular fruit when it becomes more plentiful and the price comes down within reach of the ordinary pocketbook."

The majority of our members with whom I have discussed the question, feel that sooner or later we have to do our own marketing. One of them says: "I believe we should confine our efforts to one city at a time. As the greatest danger of having the fruit rejected by one who does not know the avocado is from eating it when it is not at its best, it will be of the greatest importance that there should be one at hand who knows when each variety is at its best. The Association should place such a man in the city to be educated and have him handle and sell the fruit. Place him at a salary. Let him have but one object—to introduce and make friends for our fruit. Only one who has a real love for and faith in the avocado should be considered worthy for this position." One of the largest growers in the Association says: "It goes without saying that the producers must look forward to some other method of marketing their output than through the commission houses." Another: "The commission houses want such high commission that business through them is not satisfactory." I wish to quote from one more source, from a man who has had a great deal of experience buying and selling

avocados and who is broad enough to look at the matter from our standpoint. He says: "I think sales direct from grower to consumer is not the correct way. * * * I think the Avocado Association should form a marketing place in Los Angeles where the growers could take or ship fruit and receive a price per pound, such price to be determined by the board of directors after they have carefully canvassed the situation as to the amount of fruit available. The fruit should be distributed from this marketing point to local consumers and shipped to distant markets. They could arrange for growers to ship direct to consumers and distant markets but it should be done under direction of this marketing point. These are the most important points, and I think should be discussed thoroughly by members of the Association."

Naturally, we should start in a small way. Our big problem is to tell the public about avocados and furnish them the kinds that make them want more. At present the public on this coast is big enough for us to tackle. As one of our members brought out in a paper several years ago, we should have 100,000 customers in Los Angeles alone. We should see that every one of the thousands of rich and intelligent tourists who come here annually has ample opportunity to taste the finest fruit that California can grow. We must make sure that the public knows what a ripe avocado is. We must educate the trade, from boss to clerk, and we must tell the chef to put the soft pedal on the peanut-oil mayonnaise and the cottonseed oil French dressing. We must get a brand, trade mark or some slogan that will appeal to the public more than our present cry of "Eat Avocados," and that will eventually accumulate a valuable good-will for us. We must advertise as much as our means allow at the proper time—when our crop is heaviest. We must always be sure of having a supply of rich, ripe fruit to satisfy the trade after we have stimulated the craving for our product.

We should have an office where the hundred thousand questions of our hundred thousand ultimate consumers will be courteously and intelligently answered, where the trade can send their orders, where our secretary will have at least a modest equipment for the transaction of his ever-increasing business, where our members can make their headquarters in Los Angeles. In connection with the office we could have a packing-room where shipments received from the growers could be inspected, sorted, repacked for local or distant shipment. Such a place would soon become the most interesting and the most important place to the avocado industry. We should have to select the location with a view to its expansion in the near future.

Until we centralize our marketing operations and all co-operate for the common good there will be almost as many different opinions as there are members of the Association on even the most important subjects. Take the question of prices, for instance: One of our members who has large, handsome fruit for sale has received as high as \$14 a dozen for his fruit; another sold fruit weighing about a pound each to a Los Angeles store for \$7 a dozen which the store sold for \$2 each; another sold all his at \$10 a dozen; another sold his fancy Guatemalan fruit for \$1 a pound; another says that 60 to 75 cents a pound for the Guatemalan type fruit and 25 to 35 cents a pound for the thin-skinned is correct; another got 45 cents a dozen for his thin-skinned on the trees, and they are good fruit averaging 6 to 8 ounces; another with fruit slightly smaller got \$1.50 a dozen delivered to the nearby market; another sells his Fuertes at \$7 a dozen locally; another sells his Fuertes at \$10 a dozen less 10% commission in San Francisco; one sells to a large hotel at 50 cents a pound. Levy & Zentner quote: $\frac{1}{2}$ pound fruit \$3.00 doz.; $\frac{3}{4}$ pounds fruit \$5.00 doz.; 1 pound fruit \$5.00

to \$6.00 doz.; 1½ pounds fruit \$8.00 to \$11.00 doz.; 1¾ pounds fruit \$12.00 to \$14.00 doz. One guess is as good as another.

If there is any consensus of opinion among our members on the subject at present it is that it is best to sell the large fruit by the dozen, the smaller and irregular-sized fruit by the pound. If all the fruit were to be sold by the dozen it should be graded into different groups according to size, i. e., 10 to 12 ounce, 12 to 14 ounce, 14 to 16 ounce, 16 to 20 ounce, etc.

Take the question of ripeness of fruit. One of our respected members of long experience writes thus of the people who are handling his fruit: "I find that they sell the fruit comparatively green, claiming that the trade demands it. (Levy & Zentner say it is absolutely essential to pick them "somewhat green and hard" to ship well and to keep long enough for the dealer to dispose of them). Formerly I would have condemned this method but lately, especially this year, I find that, like the Bartlett pear, the avocado does not have to be mature to be edible and that it will soften satisfactorily and become very good eating when perhaps only two-thirds grown. While lacking in oil content to some extent the flavor is to my taste superior. The seed matures ahead of the rest of the fruit and it may be that we will find that the test of edibility is the maturity of the seed and this will require more or less expert knowledge * * * At present the market is not very critical as to variety. If the avocado is good size it will sell at a good price, more or less depending on the looks." Is he right about the maturity of the fruit? What expert is going to follow this up for us conclusively? How can an expert follow this up successfully unless he has a great number of shipments to examine? How can we better co-operate with the State and U. S. authorities in their efforts to keep unripe fruit from the markets than to have our market representative appointed as inspector for the State or the Government or at least work with their men?

Packages: Everything from a peach box containing 15 one-pound avocados to an orange container is recommended. Some recommend a crate holding three dozen one-pound fruits having one end closed so that we could paste a nice label on it advertising the word *Avocados* prominently and the name of the variety, the shipper and the contents. One San Francisco commission house writes: "The kind of container used is an important question. From close observation we have come to the conclusion that large sizes should be packed in boxes containing from one to two dozen and the smaller sizes in boxes containing from three to four dozen to the box. These containers are recommended because they hold about the average quantity that the retail dealers and the restaurant and hotel buyers purchase at one time. Later on when the fruit, by reason of large production, takes its place with the leading products of the state a standard container should be introduced for uniform use. We believe the Association would do well to consider a package similar to that used for citrus fruit. We find that the best results are obtained by selling avocados by the dozen. This method, however, may not apply so strongly in other markets as it does here where merchants have been accustomed to purchase only by the dozen. Selling in this manner requires less handling and in numerous ways is more satisfactory than to handle by the pound, crate, or otherwise. This is the one particular reason why we have recommended the one, two, three, or four dozen containers and the contents should be very plainly marked on the boxes. This will eliminate a second handling when they are received here. Not only this but in case the boxes are robbed en route the receiver will then have a basis for a claim against the express company."

A number of our members who have done considerable local shipping favor the lug box with cover, holding about 2½ dozen one pound fruits. It allows air to get to the fruit in transit and does not allow them to be placed in more than two layers which is important, especially when fruits are nearly mature. All fruit should be sound and firm when packed. Fruit not firm is likely to be badly injured in transit. If nearly ripe fruit is put in they should be partitioned off by themselves and well protected with excelsior or straw so that they cannot move around. Florida growers have used a tomato crate successfully. It measures 12x12x24 inches, and is used sometimes with a partition. They pick their fruit with an orange clipper, cutting the stem just above the swollen portion at the point of attachment to the fruit. Coarse excelsior is used above and below each layer as a cushion. They ship mostly by express.

With proper packing it has been shown that our thin skinned varieties, picked at the right time, will carry to any part of the United States. There is no reason why the Association cannot successfully handle these rich, smaller fruits and make them as profitable per pound for its members as the larger, more showy fruit. One commission firm states that the hotel trade is using more of them than of the larger fruit now and that it is the retail grocery trade that asks for the larger sizes. Practically none of the trade knows anything about varieties. Another dealer says that only 8% of his trade asks for any particular varieties. The smaller fruit will probably be the kind the average buyer will first taste. Many will always prefer them because of their rich flavor as a class and because of their convenient size for family use. The Association will have to discover the proper basket or carton designed for family use for this smaller fruit. Such details can be easily mastered when we have our marketing organization and a place where we can iron them out. Box-makers and others experienced in such matters will be quick to help us with samples, figures, demonstrations, etc. when they learn that we are a live business organization and not merely several hundred widely scattered individuals.

In conclusion I wish to touch on another phase of the situation brought out by a letter of one of our most faithful and beloved members. He says: "Just what part the Association must play in the new and changed order of things is something I have given no particular thought to. This fact is clear enough, however, that when it does engage in the marketing game it will then change from the rather social character it has so far had, to one of a more serious nature. In fact the whole Association would immediately take on a different character in my opinion. Hence it is a serious and vital question to approach. I think it is one which may profitably be discussed at the next meeting."

Why cannot the purely business part of our marketing organization be so segregated from the delightful social gatherings that we all anticipate and enjoy that we should lose none of the treat in store for us at these friendly meetings? According to our By-Laws the purpose of this Association shall be to improve the culture, production and *marketing* of the avocado. We certainly have done something toward improving the culture and we are all doing our utmost to speed up the production. Is not it equally important to solve the question that will determine whether our industry is on a firm foundation or not? It seems to me that with the same energy and the same spirit of co-operation that the members of this Association have shown in the past, we can form a marketing organization that will be a credit to the Association and that will assure its permanence.

WORK OF THE CALIFORNIA NURSERYMEN'S BUD SELECTION ASSOCIATION.

L. B. SCOTT, SAN JOSE, CALIF.

Mr. President, Ladies and Gentlemen:

It may seem somewhat strange that a representative of a co-ordinate association interested in the development of the fruit industries of California should appear on the program of another organization to discuss the work and objects of the association he represents. However, as I proceed with my subject I believe you will agree that the California Nurserymen's Bud Selection Association may be of considerable assistance to your avocado association. It is solely with this object in view that I intend to take a few minutes of your time today in briefly outlining the proposed activities of our Association.

In order to secure the proper historical setting it will be necessary for me to refer very briefly to the investigations which the United States Department of Agriculture has been conducting since 1909 under the direction of Mr. A. D. Shamel on the improvement of citrus fruits through bud selection. While it has long been recognized that bud variations exist, until Mr. Shamel began his very comprehensive investigations with citrus fruits no one had any idea of the frequency with which these variations occur, or that by using proper care in the selection of bud wood the possibility of propagating these undesirable variations could be reduced to an almost negligible factor. The results of these investigations have appeared in Department bulletins and are now a matter of permanent record. Prominent citrus growers have stated that Mr. Shamel's investigations have already meant millions of dollars to the California citrus industry. This work has suggested similar lines of investigations which could be carried on with other fruits. Already considerable work has been done by Department investigators and by your Association in studying the question of bud variation within some of your standard avocado varieties. Similar work has been done in this state with olives, and to a limited extent with walnuts. In the east the Department of Agriculture has conducted bud selection investigations with apples and peaches in Connecticut, and in co-operation with the Michigan State Agricultural Experiment Station has for several years carried on detailed studies of bud variation in Northern Spy and Baldwin apples. In Florida and Alabama a considerable amount of performance record work has been done with citrus fruits. The work carried on in different parts of the country has shown that bud variation is a matter of frequent occurrence in all our fruit varieties, and is not confined to any particular class of fruits or to any particular locality.

A number of prominent deciduous fruit growers and nurserymen have long recognized the fact that there was just as great a need for the careful selection of bud wood in all deciduous varieties, but it was not until sometime last summer that Mr. William T. Kirkman, Jr., of Fresno, conceived the idea of forming an organization which would furnish all the buds used by the different nurserymen who became members of this organization. With this plan in mind he conferred with other leading nurserymen and fruit growers in the state, and later with state and federal investigators. As a result of these various conferences the present organization known as the California Nurserymen's Bud Selection Association has been perfected. The primary purpose of the organization is to furnish buds of the leading standard fruit varieties grown in this state to the different commercial

nursery firms who are members of the organization. In addition, however, the Association will furnish buds and scions to any fruit grower who desires to purchase them for use in top-working. To this extent the organization operates as a public service, and because of this feature has the hearty co-operation of the State University, the State Department of Agriculture, and the United States Department of Agriculture.

In the case of citrus fruits, the work started in 1909 revealed so many interesting features that by 1912 or 1913 a large number of citrus growers in this state were securing actual individual-tree performance records on every citrus tree which they owned. The California Fruit Growers Exchange, recognizing the great value to the citrus industry in having every tree in an orchard bearing a uniform and high-grade quality of fruit, in 1917 organized in the Supply Company of the Exchange, a division known as the Bud Supply Department. As a result of Mr. Shamel's investigations, and also because citrus growers for several years had been securing individual-tree performance records the Bud Supply Department of the California Fruit Growers Exchange right from the start was able to furnish buds from record trees of the ideal strains of the standard citrus varieties grown in this state. It was not necessary for the Bud Supply Department to carry on detailed investigations, but simply to utilize the facts which had already been established. In the case of the California Nurserymen's Bud Selection Association, while it is recognized that just as important variations exist in fruit varieties other than citrus, nevertheless as far as this state is concerned this has not been proven experimentally. It therefore remains for this Association, or some other agency, to carry on investigations similar to those which have been conducted with citrus fruits. The association therefore has set aside a fund of \$5000 a year for a period of three years, which will be turned over to the United States Department of Agriculture to be expended in deciduous fruit improvement investigations in California. While it is recognized that the results of these investigations may not be available for several years the directors of the Association believe that considerable work can be done on the question of elimination of varieties and also in better methods of selecting budwood than have been followed in the past. The commercial activities of the organization during the coming year will be directed along the line of: first, securing definite action on the elimination of varieties; second, selecting budwood from bearing trees in established plantations; and third, the starting of commercial individual-tree performance records on just as large a scale as can be handled. In the matter of elimination of varieties the work which has been done by your Association will be taken more or less as a model.

It is practically agreed by all California fruit growers that with every fruit there are now too many varieties listed, and that in every case if a few varieties could be selected and developed as representative California fruits it would simplify matters, not only from the nurserymen's standpoint, but also from the standpoint of the grower and shipper. With this end in view conferences have been arranged with the leading shippers, canners, and associations of fruit growers. It is hoped that as a result of these conferences, a short list of varieties can be selected for each fruit which has any commercial importance in the state, and the work of the Association directed along the lines of securing the very best possible type of budwood within these varieties which are recommended by the different fruit interests.

During the first few years it will not be possible to cut buds from performance record trees, except in the case of avocados, olives, and walnuts. For the

time being all the requests for citrus budwood will be referred to the Bud Supply Department of the California Fruit Growers Exchange. In the case of other fruits orchard surveys will be made and trees will be located which by their habit of growth, character, and production of fruit appear to be typical of the variety which it is desired to perpetuate. Commercial individual-tree performance records will be started on an extensive scale so that after two or three years buds will not only be cut from selected trees but from trees on which an actual record of the amount and quality of fruit which they have produced for a series of years has been secured. An accurate track will be kept of a portion at least of the progenies of these selected buds, and performance records will be kept on these second generation trees. Eventually all the budwood handled by the Association will be taken from these second generation selected trees.

This, in brief, outlines the purpose of the Association. The question you will naturally ask is, of what benefit is this association to me, an avocado grower? In addition to being an avocado grower you are no doubt interested in other fruits. You may have a few peach trees which you wish to top-work to another variety. The California Nurserymen's Bud Selection Association provides a channel through which you can obtain scions for top-working, selected in just as careful and painstaking a way as is possible.

The Association's work benefits you when you come to purchase nursery stock, if it is stock propagated from buds selected by the Association's staff. In the direct activities of your own avocado association we will be very glad to co-operate with you in establishing your own bud selection department, and if this department is established on a sound working basis so that it can do for the avocado interests what the Bud Supply Department of the California Fruit Growers Exchange is doing for the citrus industry we would then refer our requests for avocado budwood to your association. In addition we will be very glad to assist you in starting performance record work, for if the various fruit industries in the state can be induced to secure performance records on an extensive scale for the particular fruit in which they are interested, and if these records are made in a thorough, careful, painstaking way they will locate many trees which can be used as sources of budwood and thus reduce the actual amount of record work which the members of the staff of the California Nurserymen's Bud Selection Association will have to do.

In closing let me impress upon you that the California Nurserymen's Bud Selection Association is operated as a public service. It is hoped that you as members of the California Avocado Association, and also as individuals, will utilize this service.

GUATEMALAN AND MEXICAN AVOCADOS FRUITING IN FLORIDA

JOHN B. BEACH, WEST PALM BEACH, FLORIDA

Mr. President, Ladies and Gentlemen:

The avocado which has been grown commonly in Florida is of the tropical or West Indian type, and only within the past fifteen years have any of the Guatemalan type been tried.

The first were from seeds introduced by the Bureau of Plant Industry, and afterwards we began getting scions, and occasionally a budded tree from California. The scions were mainly used for top-working old trees by cleft grafting

which produced fruit in a few years' time. Thus we fruited many of the California introductions almost as soon as they bore in California. In like manner several of the new introductions made in 1916 and 1917 by Wilson Popenoe for the Bureau of Plant Industry have already fruited here, and many more are setting fruit this season and promise to give a good account of themselves next winter. Of the former, Nimlioh (44440) produced some typical fruit, corresponding closely in every particular to his official description, and ripening in March.

Panchoy (44625) ripened in December, and proved exactly identical with the official description in every particular. It is also a good grower.

Lamat (43476) made one fruit, which was delayed in shipment to Washington, so that it spoiled before it was received. It does not appear as vigorous a grower as the other two.

Of the California introductions, Blakeman has fruited for two years, and produces fruit of good quality, weighing up to 1½ pounds, and maturing in January and February. It seems generally a good grower, though differing in that respect in localities.

Champion has not proven successful and has been abandoned.

Dickey has been fruiting with Mr. Cellon at Buena Vista, and seems to be a good grower, productive and of good size and appearance, as well as quality. But it is so difficult to propagate that he has but two trees of it. The season is November, rather early for the best markets in Florida.

Dickinson is doing better in some places than others, but as yet has not matured any fruit.

Lyon has so far shown an exaggeration of the faults it has in California, and what fruit has been produced generally cracked before maturity.

Meserve I have abandoned, because of lack of vigor, but Mr. Krome has trees which are doing fairly well and have produced good fruit weighing 16 to 18 oz., ripe in January and February. It has done as well at the station at Miami.

Royal was fruited by Mr. Hendry at Ft. Myers, but was very small and deemed by him as worthless. From this variety, Walker's Royal, strange as it may seem, have come two seedlings which are now among our most popular commercial varieties, and many acres are being planted to them in Dade County this year. They are *Taylor* and *Wagner*. It seems that the two seed were taken from specimens of Walker's Royal sent to Washington, and one seedling was sent to California, and became the parent tree of *Wagner*, while the other, planted at the Miami Experiment Station has become our *Taylor*.

Wagner has been bearing for Mr. Krone two seasons, and he has had fruit as large as 22 oz., though the average weight is considerably less. The quality is good and it seems to be a free bearer, while it begins bearing young. The season is January and February.

Taylor, the Florida brother of the above, has been bearing 5 or 6 years and has proven a reliable cropper of fair quality and medium size, strongly resembling Wagner in foliage and habit of growth, but more vigorous and not quite as good in flavor. Its season is January and February. This variety has made a record which entitles it to recognition as of commercial value.

Atlisco has shown superior quality and excellent size, averaging 20 to 24 oz., and running up to 26; season, February and March; good grower.

Fuerte has shown itself universally an excellent, thrifty grower and generally a good bearer. Some find it maturing in November while others find it a December, January and February fruit. This difference may be due to the fact that

avocados of this type often blossom several times and sometimes the early bloom will make the crop while in other instances it may be a later bloom. Mr. Cellon complains that he sometimes finds fruit injured by hard spots, but this does not seem by any means a universal complaint.

Solano is another variety upon which there is a great difference of opinion. Some find that it ripens too early with them (October) and complain that it is lacking in richness. Mr. Cellon finds nothing to complain of on that score and his fruit holds well into December and January. All agree that it is a splendid grower, a handsome fruit and that the seed is small and no fibre present.

Knight's Linda has fruited and produced some large specimens weighing 36 oz., of excellent quality, ripe in March. It is a good grower, like all of the introductions of Mr. Knight, and may prove very valuable after a few more years' test.

Rey has fruited this year, but the fruit was quite small.

Queen and Knight have not matured fruit yet in Florida.

Sharpless has not yet fruited but promises fairly well, though not as sturdy and vigorous as some of the California introductions like Spinks and Grande. The latter has been fruited four or five years but reports disagree as to time of ripening, though all seem to agree that it is a fine grower and a large fruit of fair quality. Season from October to January.

Spinks is a vigorous grower and promises to be prolific, but has not been under test long enough to establish either its season of maturity or productiveness. What fruit the writer has grown matured in November, but the first crops upon young grafts on old stocks often ripen prematurely. Size about 25 oz. and quality good.

Nutmeg has shown a tendency to develop hard lumps inside the fruit like detached pieces of rind, which scatter through the fruit and ruin its value.

McDonald ripens in February and March, and is of fair quality and quite productive, though the size of the fruit on the same tree varies greatly—from 8 to 24 oz. in some instances.

Schmidt has shown itself a good grower and of good appearance, size and flavor. Some complain of the presence of fibre, while others do not and deem it a valuable variety worthy of general planting. Season, March and April.

Verde produces a good fruit of medium size and excellent appearance, but distinctly pear shaped, ripening in January and February. Tree a good grower.

Perfecto is a splendid, upright, free grower and good producer in some localities. The shape is against it, being elongated pear shape, but the quality is fair; weight about 20 oz.; ripens in November and December. My own experience with Perfecto has been unfortunate, as 4-year-old grafts 15 to 20 ft. high have so far failed to hold fruit.

Taft has given quite general satisfaction, though in some places it does not seem to do as well as in others. On the whole it may be classed as a good reliable tree to plant for February market, the fruit being of superior quality and medium size. It does not show any precocity, usually taking a year longer to commence bearing than the average, but this is not by any means a bad fault, and promises a longer bearing period with better crops due to larger bearing surface.

Collins, Cella and Winslow are seedlings grown at the Miami Experiment Station, and are wonderfully thrifty growers, as well as heavy yielders. The size of the first two preclude their ever becoming commercial successes. Winslow, while small (10 to 15 ounces), is large enough to find a ready sale, one-half of a fruit making enough to serve as a single portion. It is a regular and free bearer, though the latest we have, being marketable in March, but not attaining its full

richness till April, and seldom beginning to drop before May. It has been held on the trees into August, but April is its best season. Green rind, yellow meat and nearly round in shape, slightly one-sided, but hardly enough to notice.

There is a seedling from this which has not as yet been named, that was line-grafted onto an old stump by Prof. P. H. Relfs at his place at Buena Vista so that in two years it fruited. The fruit ripened last November, and in shape was an exact reproduction of the parent but nearly three times as large. The rind was smooth, like the West Indian type, and this, taken with the season of maturity and large size, makes it seem probable that it is a natural hybrid, as the parent tree was surrounded by West Indian trees all in bloom when it was set.

Mexican stock does not thrive in South Florida sand, and most of the trees brought in from California being on this root, have failed to succeed. On West Indian stock they do very well and in the middle and northern parts of the state where there is a clay subsoil, seedlings of this type seem very much at home.

Of the California introductions Harman produces a small fruit, with a glossy greenish-purple surface and loose seed. The cream-yellow flesh is of fine buttery quality and rich flavor. It is a good grower and heavy bearer, ripening in July and August.

San Sebastian on West Indian roots is a tremendous grower and ripens its fruit in June and July when good fruit is scarce. It is a good bearer of excellent quality; though averaging small (10 to 11 oz., sometimes 13) it is well worthy of extensive planting, particularly in the colder sections.

Gottfried is a seedling of Mexican type that was grown from a seed sent from South America. The original tree is enormous and the fruit is the largest of the Mexican type that we know of. It averages about a pound, and runs up to 20 oz. Pear shaped, purplish-black, seed inclined to be loose, and skin peeling readily. In quality it is excellent, free from fibre or essential oil flavor, rich and smooth, yellow meat; season August.

SOME IMPORTANT INSECTS WHICH ATTACK THE AVOCADO IN FLORIDA*

G. F. MOZNETTE,

Entomological Inspector, U. S. Department of Agriculture, Miami, Florida

Mr. President, Ladies and Gentlemen:

There are a number of insects which attack the avocado in Florida, and their presence may cause considerable concern to growers of this fruit. Up to this time, Guatemalan varieties have shown that the same general type of insects which attack the West Indian varieties will adapt themselves to the hardier Guatemalan varieties as well. The avocado in Florida serves as a host for various insect pests subject to varying changes of temperature as far as their activities are concerned, which possibly would not attack the avocado in a more northern latitude. Some of these insect pests may have been introduced, while others may have always been present in Florida and have adapted themselves to the avocado as a host.

Like most fruits which have their particular scale pests, the avocado has its destructive scale insect. What the San Jose scale is to the apple and pear, and the red and purple scale is to the orange and grapefruit, the *Dictyospermum* scale is to the avocado in Florida. The scales vary from light grayish-white to reddish

*Published by permission of the Secretary of Agriculture.

or amber-brown, and are circular or slightly elongated. They are about the size of the red scale which attacks citrus. The scales are slightly convex, the central nipple is grayish, surrounded by a dark depressed area. It is scientifically known as *Chrysomphalus dictyospermi*, Morgan.

The section where this scale is especially destructive to the avocado is on the keys and stretches of land lying between the ocean and bay inlets along the coasts of Florida. The writer has found that the temperature runs more evenly, and averages a number of degrees warmer throughout the year in these localities than on the mainland, which perhaps accounts for the abundance of the scale in those places. It is, however, doing damage, and is to be found in varying numbers in nearly every place where the avocado is growing in southern Florida. The scale is a pest in avocado nurseries and especially finds protection where the trees are crowded together. It has been found by the writer to infest both the West Indian and Guatemalan varieties. It is known to attack various plants in tropical and semi-tropical countries.

Where this scale attacks the avocado it makes inroads into the tree, attacking the twigs and branches. The branches so attacked are gradually weakened and ultimately become of little use to the tree. Where this scale is present in numbers, the branches infested soon become roughened and crack considerably, affording entrance places for various fungus and bacterial diseases. Branches severely attacked generally show a lack of lateral twigs and foliage. This scale does not produce honey dew as is characteristic of some scale insects. It does not attack the fruit but confines its attacks to the branches, twigs, and leaves.

A thrips which often attacks the avocado in the open in Florida is the greenhouse thrips of the northern states scientifically known as *Heliothrips hemorrhoidalis* B. It possesses a black head and a thorax with the abdomen yellowish brown in color, and in size is similar to most thrips. It attacks the foliage and when very numerous may also attack the fruit. It is present on the avocado during the dry winter months, and evidently the rainy weather of summer is unfavorable to its multiplication. They work very rapidly on the foliage, and the writer has observed trees which were completely defoliated in a comparatively short time. The work of the thrips is easily distinguished from that of the red spider. In addition to the foliage appearing brown, it also possesses a roughened surface due to the feeding of the thrips. It confines its attacks, almost entirely, to the upper surface of the foliage.

Like citrus, the avocado also possesses its particular white fly in Florida. It is scientifically known as *Trialeurodes floridensis* Q. This fly is very small in size, somewhat smaller than those which attack citrus. In color it is golden brown, abdomen with large orange colored areas, and wings white. This fly may also be distinguished from a number of other white flies in that the pupae possess a characteristic fringe. It is present in nearly every locality where avocados are growing in Florida, but evidently is sensitive to varying changes of temperature as regards its activities and numbers in different localities. It prefers localities where the trees are protected and the temperature runs more evenly. The work of this white fly is similar to white flies which attack citrus, in that it attacks the foliage and produces an abundance of honey dew in which sooty mold develops on the leaves, fruit and branches. It is a pest in the nursery as well as in the bearing grove.

Another pest of importance is the avocado red spider. On the approach of dry weather in the fall this spider becomes very active, and often gives considerable concern to the grower. Especially is this true where trees are more or less neg-

lected. In shape and color this red spider is similar to all red spiders generally, and is scientifically known as *Tetranychus yothersi*, McG. This spider is to be found infesting a number of plants in Florida, among which is camphor, and has particularly adapted itself to the avocado. It may be distinguished somewhat from other red spiders in that it confines its depredations to the upper surface of the foliage entirely. It is usually from the latter part of October until April that the greatest damage is caused to the avocado by this pest. Orchards heavily infested in a short time appear as if scorched by fire. The foliage attacked turns brown and drops prematurely. Frequently there is a heavy denudation and the trees so attacked generally bear less fruit.

A species of the thrips which attacks the avocado during the blossoming period is scientifically known as *Frankliniella cephalica* Crawford. It is a close relative to the citrus blossom thrips, from which it differs in that it is much lighter in color. The species is known to occur in Mexico and has but recently been reported in this country. It is present in southern Florida, where it lives on many species of plants during their blossoming time. As soon as the avocados commence to bloom, this thrips makes its appearance. It deposits its eggs in great numbers in the bloom spikelets and other parts of the stems supporting the bloom. It also attacks the tender new growth flushing out from the blossom cluster, and deposits its eggs in the veins of the tender leaves. The thrips often so severely attacks bloom as to seriously weaken the stems which bear the fruits. Where injury is extensive to bloom it may seriously interfere with the setting of the fruit. The adults and young also feed on the blossom parts within the flower.

METHOD OF GRAFTING AND TOP-WORKING THE AVOCADO

S. W. FUNK, CHARTER OAK, CALIF.

Mr. President, Ladies and Gentlemen:

The accompanying diagram shows different methods of making cambium connections in grafting without splitting and injuring the wood.

Fig. 1. is an end view showing incision "A" through the outer bark to accommodate the scion or twig "A" which is cut to approximately fit. Also showing twig "A" inserted. Also incision "B" to accommodate twig "B".

Fig. 2 is a side view showing twigs "A" and "B" inserted and also incisions "A" and "B" for their respective twigs.

Fig. 3 shows a splice graft where the stock is quite small. The dark spot represents a little of the wax which is put on the bark hot, to which one end of the cloth is stuck, serving to hold the twig and stock together to begin wrapping. This is a very effective method where the stock is small and where twigs can be obtained practically the size of the stock.

THE WRAPPING CLOTH AND HOW TO WRAP AND PUT ON THE WAX

Old muslin strong enough to wrap tightly is the best. Next best is cheap muslin. Cut into strips about three-quarters of an inch wide and long enough to wrap the twig tightly to the stock. Beginning about one-half inch below the twig, wrap even with the top of the stub of the stock. The most convenient way is to put a little of the hot wax on the bark and stick one end of the cloth to it and begin wrapping, and when all the string is used except a couple of inches put a little of the wax on the cloth and stick it fast, then wax the cloth thoroughly, and down on to the stock. Wax top of stub well and up on the twig about half an inch. Put a little wax on top of the twig.



Grafts in position before removal
of wedge



Union of six months old graft,
diameter two inches

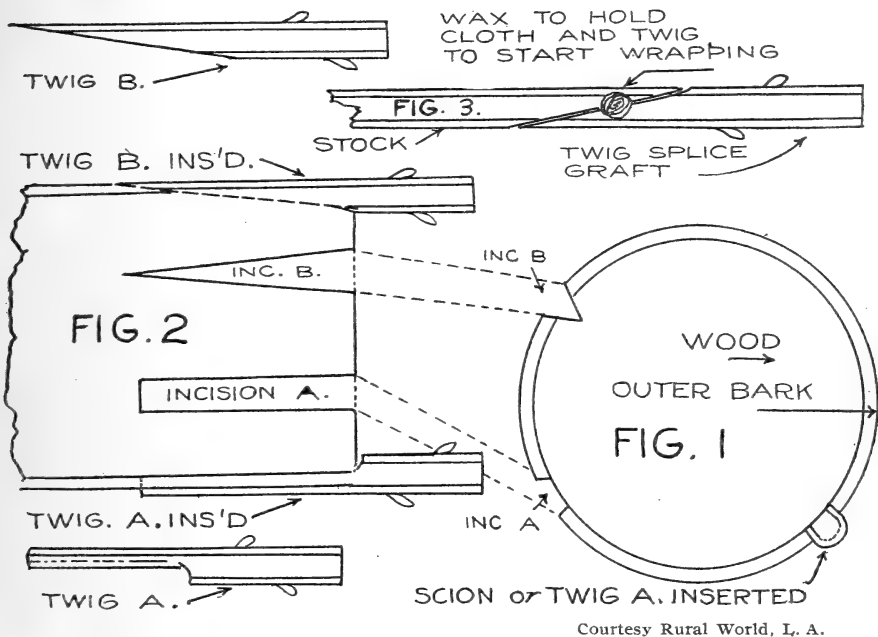


Large head formed by six months
old grafts



HOW AND WHEN TO REMOVE THE WRAPPING

Do not remove the wrapping at all, but after the grafts have grown twelve or more inches, cut through the cloth to the bark on one side opposite the twig, leaving a slight amount uncut at the top and bottom of the cloth and then with the hot wax cover the place cut to keep air and water out. This will allow the graft and stock to expand and still keep it tightly bound, supporting the twig. This is important. When the graft grows eight or ten inches, tie one branch to a stake, and allow the others to go downward. This applies to top-working large trees, especially.



Courtesy Rural World, L. A.

THE WAX—HOW TO PREPARE AND USE IT

There are different ways of making good cambium connections without splitting the wood and injuring it, but the most important thing is a wax that will make a perfectly air-tight and water-proof seal. This simple wax is asphaltum and crude oil. For about one gallon of broken asphaltum use about one-half pint of rather heavy crude oil. If the grade is light use less. There is more danger of getting too much crude oil than not enough. The small amount of crude oil serves to keep the asphaltum more plastic, makes it adhere better and prevents cracking in cold weather. I used this on the stubs of orange trees sixteen years ago when I budded them over and where the stub is not healed over the wax is still perfect. Melt together over a gas burner or other heat and boil until all the foam disappears, and also until most of the vapor is gone. Keep it to about the boiling point and apply with a small brush, kept hanging on the inside of the vessel, into the wax. Where several grafts are to be made the wax must be kept hot by keeping a gasoline or oil burner under the vessel. A suitable carrier for this purpose can easily be made.

SHADING THE GRAFTS AND WHITEWASHING

It is very important to shade the grafts as soon as possible after grafting. A palm leaf tied to the limb is a cheap and effective shade. Burlap fastened to stakes is good. Be sure to whitewash the entire trunk and limbs. Best results are obtained by grafting four or five of the largest limbs two or three feet from the trunk if they are to be obtained, using the ones that will make the most symmetrical tree. In top-working leave plenty of small limbs to carry the sap, some, if possible, on the limbs grafted, and do not cut them off until the next spring.

REPORT OF THE COMMITTEE ON
REGISTRATION AND CLASSIFICATION OF VARIETIES

Many new varieties, both from seedlings and imported buds, have come into bearing in California during the past year. The Committee, since the last annual meeting of the Association, has been active every month, and usually many times in the month, in visiting all such trees of which we could learn and sampling the fruit when it was in season and available; and also in striving to obtain the latest information and knowledge of the older kinds, which have been recommended by the Association for commercial planting.

Of the twenty-four best varieties from the highlands of Guatemala, selected and introduced into the United States by Mr. Wilson Popenoe, Agricultural Explorer of the United States Department of Agriculture, two have, during the past year, come into bearing in Florida, with a few fruit, the Nimlioh and the Panchoy, enough to prove their identity with the parent tree, hardly more, but enough to permit the Department to release the buds for general distribution, which they do not as yet permit except for these two varieties. All are being tested experimentally in California, among them we expect to find some of great value to us here and a number of them are setting fruit to mature during the coming season.

The list of eight varieties recommended for commercial planting, issued on October 25, 1917, as Circular No. 1 of the California Avocado Association, embodied the results and conclusions reached after a careful study of the different avocado varieties fruiting in California, made by the Committee and by the Board of Directors of the Association.

In a new industry, and with our rapidly extending knowledge and experience, a critical examination of the list must be made at intervals. Most of our members feel that the time has come to utilize the knowledge and experience which has been obtained during the past three years, and to bring the recommendations of the Association into accord with the most advanced knowledge.

This Association occupies the position of guide and advisor to the men who come into our young industry and plant avocado orchards—with few, or no exceptions, they will want rapid returns on their investments, with as little hindrance and unexpected expense as possible while awaiting crops. We must consider their interests and, as a matter of justice to them, we find the Taft, the Lyon and the Blakeman varieties should be dropped from the list of varieties recommended for commercial planting, which we do with regret, because the Taft fruit is very fine, one of the very best, and the tree itself beautiful, and one, that when it finally does come into bearing, will compensate those willing to wait a long time for returns; but it is longer in coming into bearing than the others that have been recommended and more susceptible to frost injury. It is no longer commercially planted. The Lyon is also a good fruit and the tree remarkably precocious and prolific and best adapted for interplanting, by reason of its slender shape, but it

has proved too generally weak and hard to raise; many trees in many plantings have died and a decay has developed in some of the fruit while still on the tree. We find this has occurred even in the parent tree. Fortunately, these defects do not interfere with the continuance of good prices for the sound fruit from the good crops being given by the good trees, nor do they interfere with planting of the trees by those willing to take the risks involved.

The Blakeman is one of the hardier varieties, with fruit of desirable size and quality, weight about one pound, color, glossy green, and seed comparatively small. Some three-year-old trees are bearing well and the parent tree is a good and regular bearer. The growth of the tree is too spreading and needs pruning when young to produce a compact and proper shape in the older tree. What we lack with this variety is experience with the young budded trees. It has been very limited and we feel that until we have more the variety should not be continued on the list.

Of the three races of avocado, we know the West Indian to be the most tropical, too tender for California and generally inferior in quality to the Guatemalan, which comes from high altitudes in Guatemala and Mexico and finds itself at home in our orchards wherever lemons will do well and be safe to plant. The fruits of the Guatemalan race so surpass the third race—the Mexican—in size, beauty, thickness of skin, freedom from fiber and good shipping qualities, that we have been led to recommend them alone for commercial planting to the exclusion of the Mexican type, which has a distinctive flavor of its own and is more hardy, standing with very many kinds, as much cold as an orange, with some seedlings even more. The usual faults with the Mexican type, besides the thin skin and very small size, are presence of fibre, of anise taste and of loose seed in the seed cavity.

It has been well understood that it was only a question of time before we would find examples of the Mexican type worthy to be recommended for planting, and now we discover we have already in the Puebla a very high-grade Mexican, which Mr. Wilson Popenoe, after a careful study of the original tree, states positively to be a true Mexican, and not a cross or hybrid, as we supposed. If we will accept his classification, and he is the one best qualified to know, we have already an excellent variety, with its fine distinctive flavor, in our recommended table to which we will, eventually, from time to time, find others to add. The Fuerte also, while predominantly Guatemalan, shows evidence of some Mexican blood.

In the table which follows the names are placed, not according to merit, but in the order in which the fruit begins to ripen, following the calendar year and using Los Angeles as a center. The ripening periods vary in different years and in different localities. In San Diego and vicinity they are earlier than those given in the table. Last season in that district Pueblas matured from October 7th to December 24th, Dickinsons from March 28th to June 7th:

LIST OF RECOMMENDED AVOCADO VARIETIES WITH BRIEF DESCRIPTIONS

Varieties	Season Dates, Inclusive	Wt. of Fruit in Ounces	Wt. of Seed in Ounces	Shape of Fruit	Color of Mature Fruits
Fuerte.....	Jan. to April	10 to 16	1½ to 3	Pyriform	Dull Green
Spinks.....	March to Oct.	16 to 20	2 to 3½	Obovate to pyriform	Purplish Black
Dickinson.....	May to Sept.	14 to 20	1½ to 2½	Obovate to pyriform	Dark Purple
Sharpless.....	Sept. to Jan.	16 to 20	2 to 3	Pyriform	Dark Purple
Puebla.....	Nov. to Jan.	6 to 14	1½ to 2½	Pyriform	Dark Purple

The Fuerte is one of the hardier varieties on the list, one of the most vigorous growing trees, an early and productive bearer, with fruit of the highest quality

ripening at a very desirable period, but with a greater variation on the same tree in size and shape of fruit than usual, and with some coming too small.

The Spinks is also a strong growing tree. The large fruit is noted for its handsome appearance and has a long ripening period lasting from early in the year until October. Some fruit tested in October by Mr. Wilson Popenoe was pronounced, in a letter which he wrote, equal in flavor to the best he had found in Guatemala. The Committee was also greatly pleased with fruit tested that month, finding it of the highest character, but found some tested early in the season, though well colored and of good flavor, far from equal to the late fruit. The seed of this variety averages large in proportion to the flesh.

The budded trees of the Dickinson are proving better than the parent, both in tree and fruit. An outstanding feature of this fruit is its notably rough, warty skin, which becomes a glossy, handsome purple and identifies the variety. The quality is good and it comes in a period of its own—in the summer.

The Sharpless is well known for its handsome, large fruit, comparatively small seed, high quality and very desirable ripening period of fall and early winter. It requires about a year and a half from the blossom to maturity of the fruit.

The Puebla tree is one of the best types of the avocado, sturdy, hardy, compact, precocious and productive. The glossy, handsome, pear-shaped, purple fruit matures at a good season, but is smaller and with thinner skin than the others on the recommended list. The period required from the blossom to the maturity of the fruit is the shortest of any kind on the list, requiring about eight months, and the seed is of medium size.

NEW VARIETIES

The Queen and Dickey A are the leaders among the new varieties, but we have only one season's fruit from which to test the first and a limited experience with young budded trees of each kind.

The Queen is rich in flavor, excellent in quality and notable in beauty of appearance of the flesh when cut. The tree is of a somewhat spreading growth. The ripening period is early summer; the seed medium to small for the large fruit, color dark red to dark purple; shape pyriform, slightly corrugated; skin thick, granular and brittle. Flesh, rich clear yellow, changing to beautiful dark green next to skin; and with no fiber.

The Dickey A is a spring fruit, it is hardy, promises well in prolificness, and the quality of the fruit is extremely good. The weight, 12 to 18 ounces; seed very small, 1½ to 2 ounces; color, dark red to purple.

There are also a number of varieties of merit among those tested since our last annual meeting. The notes taken about them have been filed with the Secretary and are open for inspection. Future letters for the Committee, or samples by Parcels Post of fruit for testing, should be sent to the Chairman at Upland.

CHAS. D. ADAMS, Chairman,
T. U. BARBER,
WM. HERTRICH,
C. F. KINMAN,

Committee.

Approved by the Board of Directors:

Wm. H. Sallmon, President.

J. M. Elliott, Vice-President.

W. L. Hardin, Secretary-Treasurer.

Chas. D. Adams.

Lester Keller.

Mrs. J. T. Stewart.

H. J. Webber.

A. F. Yaggy.

T. U. Barber. And by the Association at the business meeting on May 7, 1920.

HORTICULTURAL EDITOR OF **Orchard and Farm**

In George P. Weldon, Orchard and Farm has a Horticultural Editor of broad experience and wide reputation. He contributes each month a feature article on some vital topic of timely interest to fruit growers, and in addition writes more briefly on various phases of horticulture. He also answers inquiries of subscribers.



Mr. Weldon was born and raised on a Colorado farm. He graduated from Colorado Agricultural College with the degrees of B.S. and M.S., and from 1906 to 1908 served as Assistant State Entomologist of the Maryland Agricultural College and Experiment Station. From 1908 to 1911 he served as Chief of Field Investigations for the Colorado Experiment Station, and later became Deputy State Entomologist of Colorado, also serving in the Department of Zoology and Entomology in the State University. In 1913 Mr. Weldon became Chief Deputy of the California State Horticultural Commission, and later, Acting Commissioner of Horticulture. In 1919 he became Pomologist for Chaffey Junior College of Ontario, one of the leading educational institutions of the State. He is the author of many important agricultural bulletins and books, including "Pear Growing in California," "Apple Growing in California," and others.

George P. Weldon writes exclusively for

Orchard and Farm

LOS ANGELES, CALIFORNIA



Members, and avocado planters generally, will only be consulting their own interests by mentioning and patronizing our advertisers; it identifies them, pleases the advertiser, and helps the Association.

The California Avocado Association

AND ITS

Bud Department

The growth of our Association in importance, influence and membership is very gratifying to the officers and directors. We have now more than three hundred members, and these are from among the best citizens and successful horticulturists of Southern California. The quality of our membership has often been commented upon, and also their enthusiastic interest in the Association.

The work of the Association is extending. A Budwood Selection Department has been established. Questions of packing, shipping and marketing are being discussed, and undoubtedly it will not be long until a department will be formed to care for these important branches of the avocado business.

BUD SELECTION: The co-operation of all members of the Association and growers of avocado trees is requested, to assist in gathering data for the new Budwood Selection Department. The formation of this department in connection with the growing of avocado trees at this early stage of the development of the new industry is a very important step. It is impossible to estimate its value to present and future individual growers, and to the State of California. We are building up an industry of wonderful promise, whose benefits will be far reaching. Let us each do our part, and all work together for the early fulfillment of this promise. The first necessary work will be the location of trees of the best type for propagation, and these trees can only be located by keeping records. This work we hope to simplify to a point where it will not be a burden upon any grower. The questionnaires which were sent out in June were intended to provide data for a beginning of this record work. We have not had as many returns as we should like, and hope many more will still come in. If you have trees which you consider of exceptional value, will you not notify the secretary?

TO NURSERYMEN: The time is past for the growing of avocado trees from buds of unknown value. Tree buyers now recognize the difference in value between a tree grown from a selected bud and one grown from a bud of questionable origin. It is and will continue to be the purpose of this organization to emphasize this difference, and to urge the intending planter to accept nothing but the best. From this time on it will be a poor business venture for you to grow trees excepting under these improved conditions.

The Association is now devoting much time and expense to locating the best trees of the different varieties from which buds can be secured for your work. Excepting for a few instances, the price of these selected buds will be \$7.50 per hundred. In case of reasonably large orders, the buds will be delivered to you. In very small orders, a special arrangement will need to be made. Buds from a few "parent trees" may possibly have to be charged for at a slightly higher rate. In any event, the quality and salability of your trees, grown from these buds will be so largely enhanced that this slight increase in price for the buds amounts to little or nothing. We earnestly request your co-operation in the establishment of a high grade and quality for all avocado trees hereafter grown.

TO TREE BUYERS: The difference between planting a good tree and one of doubtful quality is so great that we cannot estimate it. Even if you are planting but one tree, you want the best. If you are planting half a dozen, there is still greater need for care. If you are planting an orchard, the difference between good and poor trees is the difference between profit and loss. Know that the tree you buy is a good one, grown from a selected bud. Ask your nurseryman, and insist on knowing from what source he obtained his budwood. We shall be glad to have you refer to us for a list of nurserymen using selected buds.

Remember that the more members we have, the more work we can do. A prize of ten avocado trees has been offered to the person who is credited with securing the greatest number of new members during this year. Even if you are not interested in winning the prize, get as many new members as you can.

R. AGNES McNALLY, Secretary, Altadena, California.

H. B. Stonebrook *Avocado Nurseryman*

As a grower of trees by modern, scientific methods, I offer my services to planters. It is my purpose to make **Stonebrook Trees mean Dependable, Honest, True-to-name Stock.** I grow all of my own trees in the field, from hardy Mexican seedlings, which have never been in pots or boxes. My buds are from the best sources. As to varieties, I grow those recommended by our Association, with a strong preponderance of the **Fuerte**. I regard **Fuerte** as first of all among Avocado trees, and heartily recommend it. If you plant one tree, plant a **Fuerte**. If you plant a thousand, eight hundred of them should be of that variety. This is in proportion as I grow them. But I can supply the other varieties in good, shapely stock and blocky specimens.

MY SEEDLING AND BUDDING DEPARTMENT

I offer hardy Mexican seedlings for sale. Why not buy some of these and grow your own trees? I will furnish buds for same, and a budder to put them in, and will keep in touch with you while you are making a success of the work. Doesn't this interest you?

Let me quote you prices on choice seedlings, good buds and the services of an expert budman.

I hope to have the pleasure of showing you my trees and receiving your early order. The best stock will be selected from the nursery in rotation as the orders are received.

Nursery, Linda Vista, one and one-half miles north of Brookside Park, Pasadena, Cal.

Dr. H. B. Stonebrook,

Telephone Colorado 208 No. 15 N. Raymond Ave.,

PASADENA, CALIFORNIA

RIDEOUT'S AVOCADO NURSERIES

*Rideout Heights, Whittier, Calif.
Telephone 4971*

My trees are all field grown, select buds and guaranteed, root and branch. All standard varieties.



*Junior member of the firm, pinning his faith
to the Lyon.*

***Lyon, Habersham (Dickey A), Fuerte
Dickinson, Queen, Spink, Puebla
and Sharpless.***

Public invited to visit my nurseries and orchard. No business whatsoever done on Sundays.

Write for illustrated catalogue and valuable pamphlet entitled, "A Few Practical Suggestions on Avocado Culture."

This leaflet gives general information about planting of the seed, irrigation, cultivation, pruning, budding, working over large trees, planting in orchard form, etc.

A. R. RIDEOUT

REAL ESTATE

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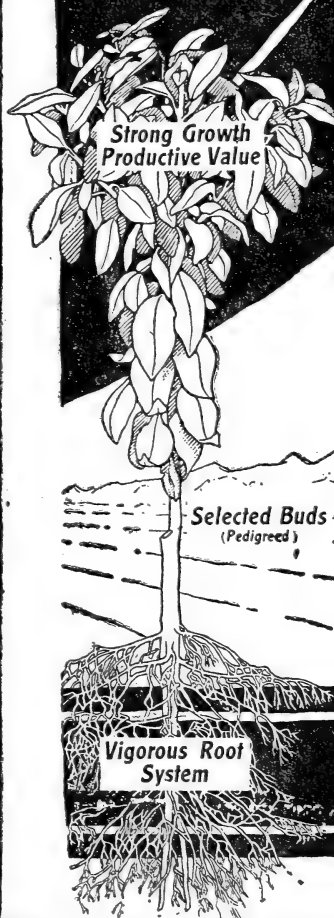
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1920 and 1921

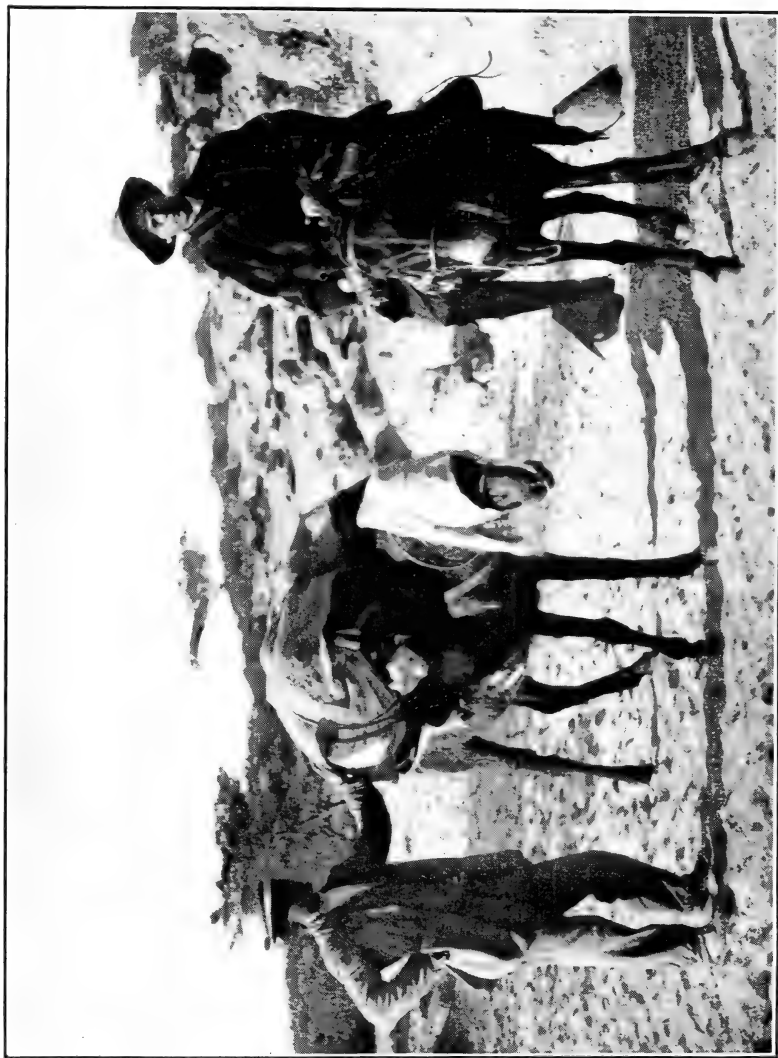
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Association



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Wilson Popenoe, explorer for the United States Department of Agriculture, returning from a trip into the Andean mountains of northern Ecuador. On the pack mule are boxes containing avocado budwood for shipment to Washington. The picture was taken exactly on the equator, which crosses Ecuador a few miles to the north of the capital city, Quito.

Annual Report
of the
California
Avocado Association
for the years
1920-1921

Including Reports of the Semi-Annual
Meeting of October, 1920, and the
Annual Meeting, May, 1921



Los Angeles, California
July, 1921

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- WEBBER, DR. H. J., Hartsville, South Carolina.

MINUTES OF THE SEMI-ANNUAL MEETING OF THE CALIFORNIA AVOCADO ASSOCIATION

*Held at Hotel Pasadena, Pasadena, California,
Saturday, October 9, 1920*

WM. H. SALLMON	. . . . .	President
W. L. HARDIN	. . . . .	Vice-President
J. M. ELLIOTT	. . . . .	Treasurer
R. AGNES McNALLY	. . . . .	Secretary

This was a one-day meeting, with a display of fruit, starting at 10 a. m. and lasting until 4:30 p. m. The summer avocados had all ripened earlier than usual and most of the fall fruits were not yet mature, so the exhibit of avocados was not so large as it would be in a normal season. However, several members exhibited other varieties of sub-tropical fruits, and all the trees and fruits which were shown were very interesting and much appreciated. There were twenty-two exhibitors.

A luncheon was served which was designed to demonstrate the food value of the avocado. The menu consisted of:

AVOCADO COCKTAIL

AVOCADO SALAD

With Sliced Tomato and Cottage Cheese

PLATE LUNCH

Avocado Scallop

Mashed Potatoes

Creamed Carrots

SLICED AVOCADOS

Thin Bread, Crackers, Salt, Lemon and French Dressing

Make your own Sandwich

AVOCADO ICE CREAM

Cake

Coffee

Twelve hundred fruits were ripened for this meal. Unfortunately in the excitement of the unexpectedly large number to be served, or through someone's carelessness, some of the unripe fruit intended for selling after the meal was used, and a quantity of good fruit just ready for eating was turned over to be sold.

In spite of the urgent request for early reservations for the luncheon, only 159 had signified their intention of attending by the date set. Preparation for 275 to 300 was made, but on the day of the meeting 403 people were served. This number almost doubled the largest gathering for an Avocado Association meal previously held, that of the May meeting in Los Angeles, and arrangements had to be made at the last minute to accommodate these extra people. All three dining rooms of the hotel had to be used, and instead of having informal after-dinner speeches in the dining room, it was necessary to secure a hall in the Hotel Green and adjourn across the street to hear the speakers.

The President of the Association, Wm. H. Sallmon, of Chula Vista, presided. After commenting on the increasing membership and interest in the Avocado Association and the value of the avocado as a food, he introduced the speakers of the afternoon as follows:

THE UNIVERSITY AND THE AVOCADO ASSOCIATION, Prof. F. L. Griffin, Berkeley.

THIRTY YEARS' OBSERVATION OF TROPICAL FRUITS, Ernest Branton, Los Angeles.

SEVEN TRUTHS ABOUT AVOCADOS, D. W. Coolidge, Pasadena.

AVOCADOS AS A COMMERCIAL INDUSTRY, Robt. W. Hodgson, Los Angeles.

Twenty-one new members joined the Association during the day. The prize of five avocado trees given by Mr. A. R. Rideout for the greatest number of new membership applications brought in by one person, went to Mr. F. O. Popenoe.

At the close of the program, President Sallmon expressed the thanks of the Association to all who had contributed to the success of the occasion, and invited all those present, with their friends, to attend the annual meeting in May.

R. AGNES McNALLY,

Secretary.

EXHIBITS AT MEETING OF OCTOBER 9, 1920

Wm. Boyes, Lomita—Feijoa sellowiana.

L. D. Cady, Los Angeles—A new thick skin seedling.

F. L. Closser, Montebello—A new two pound, purple fruit, Montebello.

D. W. Coolidge, Pasadena—35 rare fruits from 20 different countries.

J. M. Danziger, Beverly Hills—Two thin skin avocados and a plate of *Myrciaria edulis*.

J. M. Elliott, Los Angeles—Champion avocado.

Manuel Garcia, Duarte—two each, Ganter, Garcia, Murrieta.

Chas. H. Hamburg, Whittier—Ganter, Lyon, Walker and a new thick skin seedling, the Hamburg.

J. E. Hoff, Hollywood—Two new seedlings, one a Guatamalan, the other a hybrid.

Mrs. C. F. Hooper, Hollywood—Mangoes and Hawaiian Papaya.

E. E. Knight, Yorba Linda—Linda, Kist, Knight fruits.

Mather Nursery, Pasadena—Fuerte, Lyon and Sharpless trees.

W. A. Miller, Hollywood—Miller fruit, and a new hybrid seedling, the Dorothea, a seedling from the old Miller tree.

F. O. Popenoe, Altadena—Fuerte fruits and date branches from the Coachella Valley.

A. R. Rideout, Whittier—Lyon trees with fruit, and five trees which were given as a prize for new memberships.

Wm. H. Sallmon, Chula Vista—Puebla and Perfecto avocados, and Feijoa sellowiana.

B. H. Sharpless, Tustin—80 Sharpless fruits, 20 of which hung on one branch. These fruits averaged 22 ounces.

Thos H. Shedden, Monrovia—38 varieties of avocados.

W. P. Sherlock, Puente—Dickinson, Fuerte and Puebla trees.
W. D. Stephens, Montebello—Avocado seedlings and Feijoas.
Ward Nursery, Sierra Madre—New thick skin, one pound fruit.
J. T. Whedon, Yorba Linda—1 Fuerte, 16 oz., 8 French, Queen, Linda, Murrieta Green, and a new thin skin seedling, from Mexico.

CALIFORNIA AVOCADO ASSOCIATION LUNCHEON

Pasadena, California

October 9, 1920

INTRODUCTORY REMARKS BY PRESIDENT WILLIAM H. SALLMON

Ladies and Gentlemen:

It is a real pleasure to greet such a large audience of old, familiar faces and to see so many new faces. We are particularly glad to welcome those who have not met with us before, and I am very happy that so many of them have enrolled in the membership of this association.

We have had a phenomenal growth. We have not conducted any "campaign" or "drive" but there has been a gradual increase in the number of people genuinely interested in this new industry. Three years ago we had 161 members; the following year 216, and last year we set our mark at 300. At our annual meeting in May we had gone over 300. For this present year our mark is 400 and judging from the voluntary interest shown this morning we ought to reach our 400 mark by the time of our next annual meeting. Introducing a comparatively new fruit in this country, I think that is a very creditable record. I want to say to any new friends here that everybody is welcome to join the California Avocado Association. More than that, we heartily urge you to join. Whether you are the owner of a single tree or the prospective owner of an orchard, co-operation with this association will mean much to you. All that we have learned about this industry is recorded in our annual reports which are the repositories of information on the subject of the avocado. The privileges of these two meetings that we hold,—our annual meeting in the spring and this semi-annual meeting in the fall—are alone well worth the price of membership. In addition there are the circulars and leaflets that are issued from time to time and all the social advantages that go with these increasingly interesting gatherings. We invite those of you who have not yet joined to do so at the close of this meeting. A membership paid now will run through the next calendar year. Also copies of all the annual reports which we possess will be given to members who join at this time.

In this connection I want to call your attention to the very generous offer of Mr. A. R. Rideout of Whittier that he will present five avocado trees to the person securing the largest number of new members at this gathering. We did not have that notice sufficiently early to do any organization at all in the matter, but there is still time to work because the individual who reports the largest number of new members by the time this meeting closes this afternoon will receive these five fine trees. They are well worth working for. It is a very generous offer which we heartily appreciate on the part of Mr. Rideout.

Now I want to make a general explanation with regard to our situation today. It is a bit unfortunate, but then we always know how to adapt ourselves to the circumstances in which we find ourselves unexpectedly. We did not

expect the large number of people who participated in this luncheon. We had provided for about 275. Last night when I arrived I was told there were 368 reservations. Today the number who were fed has been brought up to about 400. I want to make it clear that the association is not responsible for this condition of things. Notices were carefully sent out weeks in advance but there has been a general neglect in notifying the secretary until the last moment when it was impossible to rearrange and make everything as convenient as we should like to have it. It was found necessary on short notice to use all three dining-rooms of the hotel with a little consequent confusion in the seating, and then to adjourn across the street to this larger room where we could all be together for the speeches. In spite of these handicaps I think the arrangements have been engineered very well.

When you arrange an after-dinner program, the after-dinner speaker likes to grab hold of the back of his chair, have his glass of water within reach and speak in an informal way. When he stands out here in the open in this large hall his speech takes on a different tone and you and I simply have to do our best to create an after-dinner atmosphere.

I don't know what we are going to do about the future meetings of this association. It is becoming very difficult to find suitable accommodations. It is not easy to find a place at this season of the year to feed four hundred people and get the kind of service we need. It is very difficult to get a hall free from noise and confusion, well ventilated and well lighted and large enough to accommodate the people. It is something our directors will have to consider and study. Each year we do the very best thing that the circumstances allow us to do.

Before coming to the formal program I want to call your attention to this book which has just been published by Mr. Wilson Popenoe—Manual of Tropical and Sub-Tropical Fruits. We have tried as far as possible to keep advertising out of the meetings of the California Avocado Association. I may say to you that I have been suppressing a pocketful of advertisements today. But I do not regard it as advertising to call to your attention a volume like this. I regard it as a service to you and to our industry. I think all of you will agree with me that there is no man whom we regard as a higher living authority on the avocado in all its aspects than the Government explorer, Mr. Wilson Popenoe. This wonderful book has just come from the press and it has the last word, excepting the revised list of recommended varieties, that has been said on the avocado thus far. I don't know of any group of men and women in California who would be more interested in a book like this than the members of the California Avocado Association. I hope you will buy it and let your friends know about it, and I hope we may be able to extend the circulation of this book. It is a real treasure-house, not only for those who are interested in avocados but also for those of us who are more widely interested in tropical and semi-tropical fruits which we believe can be grown here in California.

The distinguishing feature of this gathering is that for the first time we have attempted to serve a complete avocado meal. Those of you who were at the San Diego gathering will recall that about six hundred people lined up and were served with avocado sandwiches and salad. It was a most orderly proceeding, created a very favorable impression, and up to that time was the best bit of advertising done for our industry. At the Santa Barbara dinner there were served avocado cocktail, avocado salad and avocado ice cream. This year we have gone just about as far as it is possible to go by putting the avocado in some form in all five courses of a meal. It would be difficult to improve on the avocado

served as a cocktail when properly prepared and the avocado served as a salad when not smothered with oils, mayonnaises, and heavy French dressings, and the avocado crushed up in that delicious ice cream.

This, it seems to me, is the most legitimate advertising we can do. There are many prejudiced against the fruit—people who received immature fruit. I got hold of one today. It wasn't fit to eat because it was hard. I knew enough to avoid it, but I can imagine somebody else getting a fruit like that, trying to eat it and not relishing it at all. That is one of the reasons why there are people who do not understand the use of this fruit. They haven't got hold of a fruit properly matured. There are those who get hold of over-ripe fruit. They don't realize that that is not the normal avocado. There are those who for different reasons have not yet learned the deliciousness of the taste of avocado when properly prepared and served. I think the kind of demonstration we have given today is a good way of acquainting people with the virtues of the fruit. I know here and there in communities this thing has been done in a small way. I think of one community where in a grocery store a lady served the avocado all day to customers, giving small slices and serving the crushed fruit on crackers and in that way advertising. The sales in that community during that season were phenomenal. In such ways as these we can introduce the fruit effectively to the people.

We come now to the formal program prepared by the committee. When I saw the first draft of this program the committee had suggested a limit of five minutes. But the committee revised that, seeing that we have only four speakers, and we decided to increase the limit to ten minutes. And it is well to have a limit. The story goes that the preacher of the day at the chapel in Yale University leaned over to President Hadley and inquired whether there was a time limit on the sermon. "Well," replied the President, "we don't know of any souls having been saved here after the first twenty minutes!" I don't know that our salvation depends entirely on holding down to this ten-minute rule. I promise as chairman to be fair to the speakers and to the audience.

The first speaker is a representative of the State University. Among the most helpful men who have spoken to us from time to time, and advanced our knowledge of this fruit, have been the men who have come to us from that seat of learning. Today we are to hear a new voice in the person of the head of the Department of Agricultural Education, Professor F. L. Griffin, who has charge of the Correspondence Courses, including the course of ten lessons on avocado culture.

THE UNIVERSITY AND THE AVOCADO ASSOCIATION

PROFESSOR F. L. GRIFFIN

Mr. Chairman, Ladies and Gentlemen:

It is my privilege to represent the College of Agriculture in your State University. I shall endeavor to tell you very briefly some ways in which the College of Agriculture hopes to be of service to the members of this association.

As many of you know, the work of the College of Agriculture is divided into three great branches: research, teaching and extension. The research, or Experiment Station work is the basis of all the activities of the College of Agriculture. Without the discovery of new knowledge and of more efficient ways

of applying old knowledge, teachers and extension workers would soon reach the "bottom of the barrel." The part that the Experiment Station is playing in the development of the avocado industry is well understood and appreciated by some of you who have had occasion to make use of your own Citrus Experiment Station at Riverside.

Teaching, or resident instruction, has to do with the training of young men and women who enroll for the regular four year degree course in Agriculture. It is too long a story to tell here. Suffice it to say that the leaders and investigators of the future are being prepared now in the agricultural colleges and science departments of the universities all over this country. The University of California hopes to maintain the position it has attained in training investigators, leaders and teachers.

To the members of this association, interested as you are in education, I would bespeak the high school as an instrument for your use in developing an increased interest in the avocado industry. At the present time approximately one hundred departments of vocational agriculture have been established in California high schools. We ought to begin in the elementary schools to interest the coming generation in agriculture. Shall we support a vocational department of agriculture in our local high school? Some of you may be called on to answer this question. I am constantly visiting high schools in this state and I am more than pleased with the very excellent work that is being done in agriculture.

As to the extension activities of the University, there are two kinds,—the University Extension service carried on by the University and the Agricultural Extension work carried on within the College of Agriculture. Most of you are familiar with the county agent work. This is the most important kind of extension work that we have under way. Those of you who have to deal with your county farm bureau and who have met Mr. Hodgson know whereof I speak.

Another phase of our extension work, and that is what I desire to emphasize here, is that of correspondence course instruction. It is unfortunate that the great majority of the people interested in agriculture do not even avail themselves of the short courses in agriculture. Only a very few can take resident instruction.

In order that the College of Agriculture might be of the greatest possible service to the people of the state, Dean Hunt started the correspondence courses soon after assuming his duties in California. He had inaugurated similar work in Ohio State University and at the Pennsylvania State College. The correspondence course work is designed for the man on the land who wishes to pursue systematic instruction. He enrolls for the course of his choice and soon after receives the first two lessons. As soon as he has studied the first lesson and has prepared his answers to the questions that are a part of each lesson, he mails his answers to the University and begins on the second lesson. As soon as the answers to the first lesson are received at Berkeley they are carefully gone over by the correspondence course instructor, points not well understood are explained, the lesson is graded, its receipt recorded, and it is returned. The third lesson is mailed at the same time. Special technical questions are referred to the specialist best able to answer same. This, in brief, is the mechanics of correspondence course study.

A few years ago a correspondence course in Avocado Culture was prepared by Dr. Coit. Up to the present time approximately one hundred people have availed themselves of that course. In eight years over 42,000 people in this and

other states have made use of the agricultural correspondence courses. Not all of those who start courses finish them, but a large percentage carry them through to completion. We have hopes of making these courses of the greatest possible service to the people of the state. I know that this work has already helped to get a large number of city people on the land. The courses have also helped many farmers and farmers' wives to increase their income.

When the Avocado Culture course was issued four years ago varieties were recommended that are not recognized now. New facts have been discovered and new varieties have demonstrated their worth; hence it has become necessary to revise the lessons. Some of this work has been too long delayed. The war came on and Dr. Coit was drafted for work in this county and soon after returning to Berkeley he resigned from our Faculty. We lost over a fourth of our staff this last year, including Dr. Condit and Mr. Hodgson. For this reason, it is impossible to get the Avocado and other sub-tropical fruit lessons revised by our own experts in Citriculture. I am glad to report, however, that within the past ten days a way has been opened up whereby we can get our Avocado course brought up-to-date and by the first of the year the latest information will be available, in correspondence lesson form.

Those of you who might be interested in the correspondence course can undertake the Avocado Culture course with the understanding that we are going to give you all the service that can be rendered by the College of Agriculture. We have hopes of so tying up the work of the Department of Agriculture with this Association that we can keep the avocado course up-to-date. I hope that those of you who have taken the course and have found some things that need changing will call them to our attention.

Although it became necessary, beginning July 15th, to charge a fee of two dollars for each correspondence course to cover the cost of paper, materials, labor, etc., we hope that will be for this fiscal year only. Dean Hunt believes we should give our services to the people of the state.

Mr. President, I want to assure you that the College of Agriculture, insofar as I may speak for the College, hopes to co-operate with this Association and its members in every possible way. There is no other agency in this state that is capable of promoting the avocado industry or the growing of semi-tropical fruits to a greater extent than this organization. We hope to work with you so that our activities will always be of the greatest possible benefit to your members.

PRESIDENT SALLMON FOLLOWING PROF. GRIFFIN

I think on behalf of the association I can assure Professor Griffin of the hearty co-operation of this association, especially in the revision of the course in avocado culture. Some of us have taken that course and found it to be extremely valuable, but we have found also that it is not down to date and now contains some inaccuracies due to the discoveries made in these latter years. We are pledging our full co-operation with Professor Griffin's department to secure a revision of that course at the earliest possible moment.

The next speaker is a man well known in California with long experience in semi-tropical fruits, a man whose voice was heard at our Los Angeles meeting with interest when he spoke to us on The Avocado for the Dooryard. I have never been able to get a copy of that address, but I wish that at some time it might be delivered again. There are many of us who never will be orchardists but who ought to grow the avocado at home, and this was the kind of plea made

to us at that time. This man is the author of a book which is on our tables—The Garden Beautiful in California. When he comes to revise that book I hope he will include a chapter on the avocado tree. I don't think anyone has yet done justice to the beauty of the avocado tree. We have heard a great deal said about the fruits and about the merits of the different varieties. Mr. Spinks burned in upon us the desirability of getting the tree first, the right kind of a tree, a strong, sturdy, resistant tree, a well shaped tree, a tree that will produce results. He has said to us in our meetings that the tree is more important than the fruit. But nobody within my hearing has yet raised his voice in praise of the beauty of the avocado tree. We sometimes say it is like the magnolia, and there is something attractive about the magnolia. It is beautiful in a formal way, stately and formal, but the avocado with its rich evergreen leafage and its variety in shape, form and development has something intimate and responsive about it—it becomes friendly to those of us who work with it. I am reminded of those lines of Joyce Kilmer on trees. You will remember he wrote:

I think that I shall never see
A poem as lovely as a tree—

A tree whose hungry mouth is prest
Against the earth's sweet flowing breast;

A tree that looks at God all day
And lifts her leafy arms to pray;

A tree that may in summer wear
A nest of robins in her hair;

Upon whose bosom snow has lain;
Who intimately lives with rain.

Poems are made by fools like me,
But only God can make a tree.

THIRTY YEARS' OBSERVATION OF TROPICAL FRUITS

ERNEST BRAUNTON

Mr. Chairman, Ladies and Gentlemen:

Inasmuch as we have gathered at one of California's famous tourist hotels, I cannot help but hand along a little hotel joke I heard a day or two ago. It is said that in New York hotels, in every room, near the door where the departing guest may plainly read, there is a little sign as follows: "Have you *left* anything?" It is said that in the hotels in Southern California, it reads: "Have you *anything* left?"

In recounting or canvassing the experience of a third of a century among tropical fruits in Southern California, I do not recall anything particularly humorous or amusing. Yet they say, at the close of a banquet we should have all of jollity and none of gravity. However, a few weeks ago, while riding on a street car, I had with me a very beautiful cone of the Norfolk Island Pine, which I had picked up at Santa Barbara a few days before. The gentleman

sitting next to me said, "Excuse me, sir, but is that an alligator pear?" Had I not valued the cone for its herbaria worth, I should have presented it to him with the assurance that it was in just as good condition to eat that day as at any future time.

In looking back over thirty-three years in which I have been engaged in horticulture in Southern California, the one striking point that presents itself with regard to the avocado is that we have not had an earlier and more just appreciation of the value of that particular fruit, for we have had them with us for more than three-fourths of a century. Yet it has remained for the last few years to bring a true appreciation of their unrivalled value as a food.

Going back to the time when I first came here in 1887, I remember that then the tropical fruit trees of Southern California were in greater proportion to the residents than they are at the present time. Almost every garden among the old settlers had an avocado or two of the seedling Mexican type, and trees of cherimoya and sapote. I remember in those days going up and down San Pedro Street, where now all are business houses, and finding in the gardens there, avocados, cherimoyas and sapotes, all since chopped away because of lack of appreciation. There were points in Hollywood, in San Gabriel Valley and along the foothills where avocados were grown in considerable quantity. They were very poor fruits, large of seed and sparse of flesh, and for that reason very little attempt was made to select anything worthy of commercial growing, and the avocado, excellent in flavor though it was, was lost sight of. Yet twenty years ago they were sufficiently appreciated to find a market in Los Angeles for the few produced. In 1894 the plant firm I was with, Lyon and Cobbe, was asked by Lewis Bradbury to obtain as many seedling trees as we could find and I am wondering if the original Spinks tree was not among the lot I collected.

I well remember on the 18th of September, 1901, now more than nineteen years ago, standing on a street corner in Tustin, under the shade of a seedling avocado, talking with Mr. Samuel Tustin and the late Professor A. J. Cook, upon the merits of the fruits that hung above our heads. The tree contained from two to three hundred globular fruits, very black in color, and I should judge about three inches in diameter. Mr. Tustin informed me that he had a demand for more than the tree would produce, and was selling them wholesale at 25 cents each. Inasmuch as that was twenty years ago, I am surprised that with the stimulus of 25 cents for each fruit, nothing was done toward planting commercial orchards. A few weeks ago, I visited this tree and found it still standing and bearing fruit, though now surrounded with curbs and sidewalks. It was in the old days a most excellent fruit.

That was before Juan Murrieta and J. C. Harvey began distributing throughout Southern California, seeds of avocados which they had secured in Mexico. It was about eighteen years ago that Mr. Harvey began doing what little he could to distribute the seeds, which were the parents of some of our better varieties of today. I visited the Harvey and Murrieta places at the time these early fruits were started and remember the excellence of the fruit, and it seems very strange that its value has not been earlier recognized in view of the fact that even at that time a few of us realized the necessity of having a fruit that could qualify as a food in the way the avocado does, filling a field that is impossible to any other fruit yet discovered.

It has been a deep pleasure to me to have advocated for a number of years, by voice and pen, the planting of avocados in every door-yard. I was asked by many nurserymen why I did not advise planting orchards. I replied that I

was not trying to commercialize the avocado, but merely to popularize, and added that "if everyone who reads my article or hears me speak on the subject will plant one in his back yard for family use, it will not be long before the gospel will spread and commercial orchards will follow." I believe that has proven true, to a large extent.

Now my friends, in closing, I wish to voice a plea for an amendment to the fruit standardization law of the State of California, to include the avocado. Mr. Murrieta called my attention a few days ago to this most necessary act and asked me to bring it to the attention of this assembly.

There are varieties, black or purple in color, which are not ripe when they attain full color, and others which are perfectly black that need to be picked before that stage. Last year Mr. Knight called our attention to one of his most excellent introductions that should be picked when the purple color has spread two-thirds over the fruit. I hope in the end, we may at least have a legal limitation as to when the fruit has reached the proper state for consumption or for market.

In mentioning Mr. Knight's varieties, I will close by saying that a few days ago I was presented with a Knight, grown by Mr. Knight himself, who has stated that he did not consider it one of his best. The fruit was in prime condition, and although I have tasted every named variety known to me, and countless others that I know not the name of, I am frank to say I have never tasted a better avocado. So in closing, ladies and gentlemen, I cannot do better than say, "Good Knight!"

PRESIDENT SALLMON FOLLOWING MR. BRAUNTON

It is very appropriate that while we are enjoying the hospitality of this beautiful city we should have one of its citizens on our program. Mr. Coolidge was the first secretary of this association, one of its charter members, and a member of the first board of directors. What he has to say is always of interest.

Mr. D. W. Coolidge, of Pasadena.

SEVEN TRUTHS ABOUT THE AVOCADO

D. W. COOLIDGE

Truth 1. The avocado is one of the most beautiful evergreen trees that grows. Its spreading branches afford shade and comfort to man, mockingbird and mealybug. Why plant pepper, acacia and other trees where you can grow the avocado?

Truth 2. The avocado tree can be, and is, successfully grown in California, particularly in the southern part. I haven't the exact figures, but I am assured that there are today more than 500 acres of avocado trees planted in orchard form, and perhaps as many more are grown in the gardens surrounding our homes.

Truth 3. The avocado tree will grow and bear fruit as regularly as any other fruit tree when the proper varieties are planted in proper localities in Southern California, and contrary to the belief of many the avocado is not over particular about the kind of soil it is grown in. I have seen very fine fruits grown in adobe, light sandy loam and decomposed granite soils. Although the tree is indigenous only to the tropics, we have varieties fully as hardy as any of the citrus, and the scope of this industry is wider than is generally believed. In

beginning the industry we have all planted many inferior varieties, but each year we are gaining knowledge, and in planting nowadays we eliminate some of the varieties that a few years ago seemed desirable.

Truth 4. The fruit of the avocado is about the most tasteful and nourishing food that grows out of the ground. I repeat what I said at the dinner at the Maryland two years ago. I would persist in eating avocados if I knew they were a little less poisonous than arsenic, I like the taste so well; and if they were as bitter as quinine and in every way disagreeable to the palate I would continue to eat them, knowing their beneficial effects as a food and medicine. I maintain that the most delicate stomach can take the avocado when animal fat would upset it. I have heard that if one about to embark on a sea voyage would eat no other food than the avocado for the preceding 24 hours seasickness would be unknown.

Truth 5. Growing avocados has proved the most profitable of any horticultural experiment yet conducted in California. You all know for what this fruit is selling. From \$1 to \$2 each for fruits weighing a pound or more. One of our largest growers assured me that he had received as high as \$14 per dozen wholesale for his fruits and that a great part of the crop was marketed at from \$7 to \$9 per dozen.

Now it doesn't seem to me that any such prices will be obtained when we have thousands of acres of avocados where we now have a few thousand trees, but I maintain that there can never be any serious overproduction because there are only two small areas, Southern California and Southern Florida, where the avocado can be grown, and when it is considered that perhaps only about 1,000 growers living in the two favored sections have to grow this valuable food product for 100,000,000 people, I ask the question, How is it possible to overdo the avocado business? Another point, when we consider the proportions that the citrus product, merely a confection, has reached, what should we expect from the avocado, an all around food that people will continue to buy because they like its taste and because of its nourishing food value. The government experts figure that a pound of avocado has as many food units as a pound of meat or eggs, and should it ultimately sell on this basis, there is 25 to 30 cents each for fruits weighing a pound. I really believe when the time comes that I can have avocados for 366 days in the year, I will cut meat entirely out of my diet.

Truth 6. One hundred years from now history will record that the highest civilization will cluster around the sections where the avocado is grown. The strongest people physically and mentally, the happiest and most beautiful children will be those who make the avocado, instead of meat, their daily diet. I have often marveled how babies and very young children take to the avocado at once. If I have a greater love for anything than the avocado, it is for ruddy, happy children.

I am one who has always believed in the human race, who has always believed that man is constantly rising, and while I am not a strict vegetarian, I have almost reached the point where I do not wish to be a participant in the slaughter of beautiful animals simply for food. I am sure I could never content myself on a diet of turnips or starchy vegetables alone—we must have fats; but the avocado comes in to fill this need. I say, speed up avocado growing, hasten the day when we can have a sufficient quantity of this fruit so that it may be sold at a price that all can afford.

Truth Seven is a definition of a lost opportunity. Everyone living in Southern California has the opportunity to possess for himself and family this most delectable of all foods. Every day that he fails to plant from one to 100 trees is surely a lost opportunity.

PRESIDENT SALLMON FOLLOWING MR. COOLIDGE

Those of us who read farm journals of Southern California are familiar with the articles of a man who has the pen of a ready writer and whose message is always readable, interesting and helpful. We are glad to hear him here; his voice is new to us. I am glad to introduce the Farm Advisor of Los Angeles County, Mr. Robert G. Hodgson.

AVOCADOS AS A COMMERCIAL INDUSTRY

ROBERT W. HODGSON

Mr. President, Ladies and Gentlemen:

This afternoon I am experiencing a rather novel sensation. For the first time in my life I am literally as well as figuratively full of my subject—avocados.

The avocado as a home garden fruit and dooryard tree has long since proven its entire success in California and in Southern California particularly. There have been those, however, who have not believed that it would eventually become a commercial industry. I will admit that at one time thus it seemed to me. But at the present time I will have to confess that I believe the avocado has arrived as a commercial fruit industry; and there are a number of reasons why I think so. Let us apply a number of tests which one would ordinarily consider as marking the point when an industry is just emerging from the experimental period and entering the era of a commercial success.

Tests of a Commercial Horticultural Industry

In the first place, we now have quite definite information regarding a considerable acreage of land in Southern California which is adapted to the culture of the avocado. It is therefore no longer a venture to attempt to grow avocados in certain districts for they have become proven territory.

In the second place no longer do we have just a few dooryard trees. In my work I run across large numbers of commercial plantings of avocados. I would not be surprised if the total approximated one thousand acres in commercial orchard plantings at the present time. Then again there has been accumulated a fair and ever increasing amount of information relative to the cultural requirements of this fruit, enough to make it possible for the novice who will take pains to inform himself that he may be reasonably certain that he can grow the fruit without any great difficulty. Further, there is a substantial and increasing demand for the avocado.

Another reason why I believe the avocado has reached the period of commercial success is the growing recognition in other parts of the country that avocado raising in California constitutes a commercial industry. Situated as I am as County Agent in a county to which settlers from all parts of the country are coming, I receive a great many letters of inquiry regarding the prospects for engaging in various fruit industries. In the past three months, I have received at least twenty-five inquiries regarding the avocado industry. One prominent eastern apple grower stated that he was thinking of planting two hundred acres if prospects were sufficiently good.

I think we may safely say at the present time that the avocado industry has reached the stage when the pioneering is largely over. In other words, the commercial stage has been reached. It is now possible for any person who will purchase a tract of good soil in a district proven for avocados, and who will purchase well grown trees of recommended varieties and plant them and care for them in the most approved manner, to be reasonably certain that he will receive crops of delicious fruits for which there is a substantial market demand. If that does not mean that the commercial era has dawned, I do not know what would mark the same.

It is not my wish to give the inference that there are not problems still to be solved by avocado growers. The more we investigate cultural problems the more we find that we have yet to learn. I suppose there is no branch of horticulture that has advanced farther in orchard technique than the citrus industry but citrus growers all recognize that as yet only a few of the important problems have been solved. There will always be problems with the avocado industry, but I feel thoroughly convinced that we have solved a sufficient number for the industry to be now considered as commercial.

Rapid Progress of the Industry and Its Relation to the Association

I think it is quite fair to say that in the past decade the avocado industry in this state has progressed perhaps as far as any other industry of a similar nature in twenty-five years. And I have been interested in thinking about the reasons for this. A number of reasons occur to me but I believe the outstanding, big reason for the phenomenal growth in interest and development of this industry is the California Avocado Association; and I congratulate the avocado that it has an association of this sort fostering its culture. I congratulate the association on the strides that the industry has made in this comparatively short time. For it is due to the Association very largely that we have so much information relative to the soil, climatic and cultural requirements of the avocado, and that we have the present comparatively large area planted. Of particular importance in the early history of this industry was the appointment of a Committee on Varieties, which sifted out the undesirable and unsatisfactory sorts and gradually reduced them down to the present approved list of five. It is really a remarkable thing to have occurred so early in an industry. Generally such a result comes only after years of commercial competition.

Having an Association of this kind behind the industry has meant saving literally thousands of dollars for those who have desired to engage in avocado culture. The Association has been responsible for enlisting the interest of the Department of Agriculture—that great institution which is spending so many millions of dollars in investigating problems for fruit growers and farmers. It has been through the Association that such men as Popenoe, Scott, Webber, Coit, Condit, Chace, Jaffa and others have interested themselves in the avocado. I am sure we will all agree that it is with the greatest benefit that they have done so.

The Association has been largely responsible for the interest of the State University in this fruit. Until recently there has been a Division of Citriculture of the State College of Agriculture which included the teaching and investigation of avocados. And in that connection I would bespeak your continued interest and support of this division. At the present time there exists no Division of Citriculture,—there is no one assigned to work on avocados. There are reasons for this condition. Many of you know that the State University has been passing through a very stringent financial crisis, the result being the elimination

of some of the best teachers and investigators from its staff. It is impossible for the institution to meet the situation. It can only do so with the continued support of associations of this sort. This association can do material good to itself and to the state by manifesting its continued support for the University.

Reasons for the Ultimate Success of Avocado Culture

There are some outstanding reasons why the avocado was bound to become a commercial success. The first one lies in the interest which is today as never before being shown everywhere among consumers and the general public in new and strange fruits. This is the result of cumulative publicity. There was a time when you could interest the American consumer only in the standard fruits to which he was accustomed. At the present time however, he is interested in new things and willing to try them. This is of immense value to a new fruit industry.

Then we come to a second outstanding reason, which is the marked excellence of the product. The avocado has no rival in nutritive quality and is ready to serve when ripe without any treatment or curing. When one considers the olive, its nearest competitor, which must be run thru a complex series of processes before being edible and yet which, since 1900 has reached the volume of business that the olive industry today enjoys, one can see what a big advantage the avocado has in this regard.

Then too, we must face the fact that the fruit is one that can be placed on the table all the year round. That is to say, there are varieties that mature all the year round and a supply can be kept coming to the markets continuously.

Last, but not the least reason is that the fruit ripens and bears sufficiently well in this state to make it possible commercially to put it on the market at a price which will absolutely defy competition when it comes to the nutritive value.

Problems Still to be Solved

There are problems confronting the industry with which it must engage itself if it continues to remain commercial. And I am pleased to see the way in which the Association is anticipating these problems. In the citrus industry the deterioration of varieties and maintenance of desirable varieties has played a very important part in the profits derived by growers. The question of bud selection and the maintenance of the best strains and varieties in the avocado is an important one and I have been very much pleased to see the Avocado Association organize a bud selection department so that its members may profit by the use of the best buds only.

Another problem is that of the standardization and marketing of the product. As soon as large quantities come on the market, which will be in a short time, then will come the necessity for rigid grading, careful handling and intelligent marketing. It is going to mean work, but when one recognizes the immense power of consumer publicity to extend and increase volume of business, one can see that the avocado faces a very bright future—in fact, there isn't any question about its future.

Again I want to congratulate this Association on the remarkable strides which the avocado industry has made and also to congratulate the avocado on having the Association behind it.

PRESIDENT SALLMON FOLLOWING MR. HODGSON

There are several things I wish to refer to before we adjourn. There has been placed in my hands a rather flashy circular and a letter of protest against the issuance of this circular through the country. One of the contributions which this association has made has been the suppression of misrepresentation of facts about the avocado. I am not sure—not having looked over this circular carefully—that facts are misrepresented, but some of our members believe that the facts are misrepresented, especially in that it is announced that this man, or firm, is selling avocados from Mexico. You know that is against the law and cannot be done legally in California. As this is not a business meeting of the Avocado Association and I think it would be unfortunate to attempt to delay this audience for the consideration of any such matter as this which requires investigation before we really can take action, I take the liberty of taking charge of this matter and bringing it to the attention of the Board of Directors at our approaching meeting. If there is any attempt at fraud, sufficient action will be taken.

It is the custom, when an exhibit of fruit is over, to sell all of the fruits which remain. Those of you who wish to purchase may find them for sale at the hotel lobby after this meeting.

There are several people and institutions who ought to be thanked for their co-operation in making this meeting a success. At our annual meeting it is customary to do this through the Committee on Resolutions. At this meeting it is the custom of the President to name these friends and institutions and to return thanks in our printed annual reports.

In behalf of the Association I wish to thank the speakers, Messrs. Griffin, Braunton, Coolidge and Hodgson for their helpful and inspiring messages; the exhibitors who have given us such a fine display of fruit, nursery stock and at this time especially, such a notable display of other semi-tropical fruits; the press which has been liberal in giving notices of our meeting; Mr. Rideout for that generous proposal of his to continue his gift of trees to the one who secures the largest number of new members. Next May someone will be given ten good trees through the generosity of Mr. Rideout. I wish to thank the manager of this hotel, Mr. Reid, for his courtesy, and Mr. Prentice for caring for the exhibit; Mr. Fred W. Herbert, of the Department of Agriculture, Chula Vista, who volunteered to take the stenographic report of this meeting, and our energetic secretary, Miss McNally, who has worked day and night for the success of this meeting which has brought greater care and responsibility than any meeting we have held.

THE SIXTH ANNUAL MEETING OF THE CALIFORNIA AVOCADO ASSOCIATION

held at

Hotel Maryland, Pasadena, May 6 and 7, 1921

WM. H. SALLMON	.	.	.	.	.	President
W. L. HARDIN	.	.	.	.	.	Vice-President
J. M. ELLIOTT	.	.	.	.	.	Treasurer
R. AGNES McNALLY	.	.	.	.	.	Secretary

The sixth annual meeting was opened by an experience meeting, presided over by President Wm. H. Sallmon. After introductory remarks by the president, Mr. Fowler of the State Exposition in Los Angeles explained something of the work being done and the opportunities for publicity through the medium of the Exposition, through which 250,000 people pass in a year. Wonderfully lifelike samples of wax duplicates of avocados were exhibited, and Mr. Fowler said that if growers would provide the fruits a large number of fruits could be copied and exhibited at the Exposition under the name of the California Avocado Association. A committee was appointed to select fruits suitable for this work.

Following the Experience Meeting the exhibit of fruits was opened. Eighty-five different varieties of avocados were shown, from 41 orchards. Among the most interesting was the display of Wm. A. Spinks of Duarte, showing 12 of the new Guatemalan fruits brought in by the Department of Agriculture through Wilson Popenoe, seven other named varieties and six new seedlings. W. P. Sherlock showed a display of forty different varieties collected from various growers. A complete list of exhibits is on file in the secretary's office.

The Annual Banquet on Friday evening was much enjoyed by 274 people. Undoubtedly had the weather been more favorable many more would have been present. President Sallmon acted as toastmaster. After a toast to the President of the United States, the speakers of the evening were introduced: N. L. Chapin, of The California Farmer spoke on "The Spirit of Co-operation in the Avocado Association;" J. C. Knollin of Orchard and Farm on "Advertising and Publicity in their Relation to the Avocado Industry;" E. A. Street of California Citrograph, on "The Function of the Horticultural Press;" C. B. Messenger of California Cultivator on "The Relation of the Horticultural Press to the Avocado Industry." W. S. Killingsworth of the Pacific Rural Press and Harold M. Finley of the Farm and Tractor were unable to be present. Mr. L. B. Scott responded to a request for a speech with some very entertaining stories.

On Saturday morning the following papers were read:

SATURDAY—9:30 A. M.

FURTHER EXPERIMENTS ON MATURITY WORK ON AVOCADOS, E. M. Chace, U. S. Department of Agriculture, Los Angeles.

DISCUSSION OF ANALYSES OF AVOCADOS FROM THE STANDPOINT OF NUTRITION, Prof. M. E. Jaffa, University of California, Berkeley.

EFFECT OF GIRDLING TREES ON THE FRUITING OF AVOCADOS, Dr. J. Eliot Coit, Los Angeles.

PROPER METHOD OF MARKETING CALIFORNIA AVOCADOS, L. W. Albright, Los Angeles.

After Dr. Coit's paper Dr. Hardin, the vice-president, was called to the chair and presided during the balance of the morning session. A letter from Mr. Wilson Popenoe addressed to the members of the association could not be read on account of lack of time, but will be printed in the report.

On Saturday afternoon the business meeting was thrown open to the public and a goodly number attended in spite of the rain and the counter attraction in the exhibit room. The meeting was called to order by President Wm. H. Sallmon. The minutes of the last annual meeting were read and approved. The Secretary's report was read, recounting the work accomplished during the year, and the treasurer's report, showing receipts amounting to \$3,235.00, expenditures of \$2,804.32 and a balance on hand of \$2,013.44.

The report of the Committee on Varieties, read by Mr. Adams, was accepted and ordered printed.

The report of the Committee on the Revision of the University of California Correspondence Course on Avocados was presented by F. O. Popenoe and approved.

President Wm. H. Sallmon then read his Annual Address.

The following amendments to the By-Laws were presented and carried:

BY S. W. JAMIESON

Art. V., Sec. 3. The Secretary shall be the clerical officer of this Association and of the Board of Directors, and shall have charge of the general correspondence. He shall collect the dues of the members and receive all moneys that may be paid to him by virtue of his office, carefully account for the same and promptly cover them into the treasury. He shall work under the orders of the Board of Directors and at all times in close co-operation with the President.

Sec. 4. The Treasurer shall be the financial officer of this Association and of the Board of Directors. He shall have charge of the funds of the Association, paying them out only by voucher countersigned by the President. He shall make a report of receipts and disbursements at meetings of the Board of Directors and a complete report to the members at the annual meeting of the Association.

Art. IV, Sec. 2, line 4 change the word "Director" to "Directors."

BY EDWIN G. HART

Art. III., Section 1. Any person interested in the purposes of this Association may, upon application and payment of required dues, be elected to either active or associate membership in accordance with their application, by an affirmative vote of two-thirds of the Directors present at a meeting of the Board of Directors.

Art. III., Section 3-a. The active membership fee shall be \$16.00 per year, payable in quarterly payments upon first days of January, April, July and October of each year. Each new member shall pay the dues for the quarter in which he is accepted as member. The associate membership fee shall be \$5.00, payable at the time the application for membership is made, and thereafter shall become due and payable on January 1st of each year. Upon election the new member shall be entitled to all publications of the Association for the calendar year in which he is elected.

Section 3-b. Every active member in good standing, when present in person or by proxy, shall have a vote upon all matters coming before the Association in its meetings, is eligible to act as an officer of the Association, and shall, subject to other rules and regulations, be allowed to market his fruit thru the Association. Every associate member in good standing, when present in person or by proxy, shall have a vote upon all matters coming before the Association at its meetings, and shall be given the benefit of all literature and information available to active members, but shall not be eligible to act as an officer in the Association or be allowed to market any fruit thru the Association.

Section 3-c. An associate member may become an active member at any time by payment of the difference in membership fee, the difference to be calculated from January 1st of the year in which the change is made.

After the above changes in the by-laws were adopted, it was moved by Edwin G. Hart:

That the Board of Directors of this Association are hereby requested to immediately take the necessary steps to organize a co-operative marketing department to be controlled by this Association. Carried.

A resolution presented by F. O. Popenoe for the standardization by law of the commercial varieties of the avocado, to check the sale of immature fruits, was not approved.

The Committee on Resolutions reported as follows:

RESOLVED that the California Avocado Association, at its sixth annual meeting this day assembled, does hereby acknowledge its indebtedness to each and all of the speakers at this meeting who have given so freely of their time and effort in compiling and furnishing to the Association and its members so much valuable information concerning the avocado and its many virtues, as well as its future possibilities; and it especially appreciates the good counsel and advice received from the horticultural and agricultural press of the state through its able representatives who addressed the members at the annual banquet;

That it also expresses gratitude to the State and Federal Departments for the valuable assistance which they have rendered in the development of the avocado industry by means of the research work carried on by them in relation to the avocado, and it especially mentions the splendid service performed in this behalf by Professor Jaffa, of the State University, and Mr. E. M. Chace, of the United States Department of Agriculture, in the investigation they have conducted in their respective departments for the benefit of those interested in avocado culture; and it also refers particularly to the work done by the Bureau of Plant Industry of the United States Department of Agriculture in furthering the development of new varieties of avocados by distributing budwood and new selections of trees among the members of this Association and furnishing information relative thereto;

That acknowledgment is hereby made of the many favors and courtesies which the Hotel Maryland has so freely extended to this Association and its members and guests on this occasion;

That the Association expresses its appreciation of the faithful service rendered by each and all of the officers of the Association in their conduct of the business and affairs of the Association during the past year, and particularly their efforts, so successfully performed, in preparing and arranging for this

annual meeting; and it especially thanks Dr. Lester Keller for securing and preparing so many choice avocados for the annual banquet, and Mr. R. M. Teague for his good work behind the screen in directing the serving of the same;

That the Association is also under obligation to Director S. W. Jameison for his diligent work in arranging the fine fruit exhibit in connection with this meeting, and to the numerous growers who contributed so much to the success of the meeting by the excellent display of fruit supplied by them;

That it further expresses its appreciation of the faithful and efficient manner in which Miss R. Agnes McNally has performed the many and varied duties that have been assigned to her during the past year as Secretary of the Association;

That the Association has suffered a distinct loss during the last year by the resignations of Mr. J. M. Elliott and Mrs. J. T. Stewart from the Board of Directors, and it takes this occasion to acknowledge its indebtedness to them for the services rendered by them as Directors in upbuilding the Association and advancing its purposes;

That in connection with the retirement of Mr. William H. Sallmon as President of the Association it is deemed to be especially fitting and proper that recognition should be given of the highly successful and satisfactory manner in which the affairs of the Association have been administered during the three years that he has served as its executive officer, and accordingly this Association hereby acknowledges its indebtedness to Mr. Sallmon for the splendid service that he has rendered in behalf of the Association as its presiding officer, and hereby expresses to him its sincere appreciation of the able manner in which he has conducted the business and functions of the Association, promoted and advanced its objects and directed its work, as well as the high standards and purposes which he has consistently maintained and carried into effect during his administration of the affairs of the Association.

GEORGE H. WOODRUFF,
WM. D. STEPHENS,
WILL R. MANNING.

Mr. Elliott explained that at an informal meeting of the directors at the time Mr. Sallmon was persuaded to continue in office for one more year, a promise was made that the gavel belonging to the Association should be presented to him, with a suitable inscription, at the time of his retirement. As that time had now arrived, the presentation was made, and Mr. Elliott also presented the Association with another gavel, made by himself, to replace the one given to Mr. Sallmon. Mr. Adams expressed the pleasure of the association in accepting the new gavel.

A resolution presented by Mr. Knight that the members of the Committee on Varieties be allowed to sit without vote with the board of directors was carried.

Announcement was made that space for a display of avocados had been allowed at the Valencia Orange Show at Anaheim and that Mr. Knight would be glad to take charge of exhibits for members of the association.

An invitation was extended by the Chamber of Commerce of Puente for the Avocado Association to hold a field day with them in August, when some of the groves in that neighborhood could be inspected, a demonstration of top working be given, and hot coffee and avocados in some form be served.

The following nominations were made for the three vacancies on the board of directors: Wm. Hertrich, Dr. W. R. Manning, G. H. Woodruff, D. W. Coolidge, S. F. Freeman, A. Ellis Barron.

The tellers reported the following elected: A. Ellis Barron, Wm. Hertrich, Dr. W. R. Manning.

Mr. L. B. Scott urged that the budwood selection work be vigorously prosecuted, and suggested that Mr. Hertrich's knowledge of both avocados and of bud selection work in citrus orchards would be of great assistance.

It was moved, seconded and carried that the direction of the budwood department be under the immediate direction of Mr. Hertrich.

Mr. Shedden moved that Mr. A. D. Shamel be elected an honorary member of the Association. Carried.

Moved and carried, that the Association send cordial greetings to its former president, Dr. H. J. Webber.

Moved and carried, that reports of the proceedings be published expeditiously.

There being no further business the meeting adjourned.

R. AGNES McNALLY, Secretary.

LIST OF EXHIBITS AT ANNUAL MEETING, MAY, 1921

T. U. Barber—Butternut, Challenge, Colorado, Dickinson, Hart's Seedling, Meserve, Perfecto, Spinks.

A. Ellis Barron—Blakeman, Taft, Verde, Walker.

Ray Billingsley—Billingsley.

Clair Bishop—Tiger, Del Rosa.

F. D. Closser—Montebello.

J. M. Elliott—Blakeman, Colorado, Dickinson, Meserve.

Exposition Park—Wax Duplicates of Avocados.

Geo. E. Fairhead—Grande.

Manuel Garcia—Leader, Murrieta 2 lb., Sharpless, Spinks.

Chas. H. Hamburg—Challenge, Colorado, Presidente, Wagner, Walker, Seedling.

G. H. Hirschvogel—Seedling.

J. E. Hoff—America.

E. E. Knight—Kist, Linda, Queen.

Henry J. Kramer—Tertoh.

G. Maag—Challenge, Unknown.

A. F. Manz—Challenge, Dickinson, Lyon, No. 15, Seedling.

Mather Nursery—Trees.

Volney Metcalf—Metcalf.

F. O. Popenoe—Grande, Merito, Oro, Verde.

Wm. M. Popplewell—Smith-Clark.

A. R. Rideout—Dickey A., Lyon, and trees.

Wm. H. Sallmon—Blakeman, Dickinson, Montezuma, Queen, Taft, and Cherimoyas.

Mrs. Ida Schaffer—Seedling.

Thos. H. Shedden—Colorado, Dickinson, Kanola, Knight, Linda, Lyon, Montezuma, Murrieta Green, Murrieta Purple, Murrieta 3 lb., Presidente, Queen, Rey, Sharpless, Spinks, Walker, Unnamed.

W. P. Sherlock—Fruits collected from the following:

N. J. Berger—Challenge, Grande, Meserve, Schmidt.

Mrs. Queen W. Boardman—California.

C. A. Booth—Cherimoya.

Mrs. L. M. Chaffee—Victory.

J. G. Gano—Atlixco, Blakeman, Colorado, Murrieta, Sharpless, Taft.

Mrs. Jacob Miller—Cherimoya.

O. Ruf—14 different seedlings.

Chas. F. Wagner—Lambert, Laurel, Surprise, Wagner.

J. T. Whedon—Dickey, Dickinson, Fuerte, Kist, Knight, Linda, Lyon, Miller, Queen, Rey, Sinaloa, Spinks.

F. DeWitt Smith—Bartley, Blakeman, Challenge, Dickey, Fuerte, Lyon, Solano, Taft.

W. A. Spinks—Benik, Cabnal, Cantel, Colorado, Ishim, Ishkal, I. X. L., Kanola, Knight, Lamat, Linda, Manik, Mayapan, Nimlioh, Pankay, Queen, Rey, Spinks, Tertoh, and 6 seedlings.

Wm. D. Stephens—Challenge, Lyon, No. 15.

Stonebrook and Samuels—Fuerte and trees.

Mrs. R. Symmonds—Sinaloa.

C. P. Taft—Blakeman, Buttercup, Fuerte, Smith-Clark, Solano, Taft, 5 seedlings.

C. F. Wagner—Lambert, Laurel, Royal, Surprise, Wagner, Seedling.

J. T. Whedon—Dickey, Fuerte, Grande, Kist, Knight, Linda.

EXPERIENCE MEETING

The principal problems discussed at the experience meeting were: overhead irrigation; amount and frequency of irrigation necessary; Avocado brown leaf; determination of maturity.

Those who reported on overhead irrigation found it satisfactory, though it was thought it might interfere to some extent with the setting of fruit. After considerable discussion and much diversity of opinion, it was concluded that as soils vary so much even within short distances, and each soil requires a different irrigation treatment, the safe plan is the scientific one—using a soil augur to ascertain the condition of the soil around the roots of the trees.

Brown leaf has appeared in some instances where trees lacked water, also where they had too much water, and in some cases where there is a strong cold sea breeze. The conclusion was that brown leaf is a sign of unfavorable physiological conditions of any kind. A letter recently received from Mr. G. F. Moznette, of Miami, Fla., reports that he found no fungus on the fruits and leaves submitted to him for examination, though he thought fungus might develop in the cracks in the fruit.

Several methods of determining maturity were suggested: yellowing of the stem, loosening of the stem at the junction with the fruit, flowering of the tree, analysis and previous experience. However, not all stems turn yellow nor become loose at maturity. Analysis would be the surest test if it did not ruin the fruit in the process. A combination of analysis and previous ripening experience with each variety would give its approximate ripening season.

The question of the relative merits of planting seedlings in orchard form and budding later, or planting budded trees was discussed at some length. Some points in favor of seedling planting were strong, undisturbed root growth and elimination of the expense of balling. On the other hand, young seedlings in orchard form are much more expensive to water and bud than those standing in nursery rows. If the seedlings are grown for three or four years, better varieties may be proven than those which would be planted at the present time, but the operation of top working old trees is expensive and uncertain.

The necessity of some experimental work on different root stocks was brought out. As has been proven with other kinds of fruit trees, there is a great variation of trees of the same variety budded on different types of roots. The selection of suitable roots for different varieties and locations is probably as important as the selection of budwood.

SECRETARY'S REPORT

Altadena, Calif., April 30, 1921.

As an educational institution, the California Avocado Association is becoming widely known. Letters come from all over the tropical and semi-tropical world, asking for information. We have now fifteen members who do not live in the United States. Our membership has grown since April 30, 1920, from 301 to over 400, in spite of the removal of 47 names from the roll. 149 new members have been added during the year.

A surprising amount of correspondence is required for an association the size of this one. During the past eleven months nearly 800 individual letters have been written from my office, and I know Mr. Sallmon has also had a large correspondence.

During the past eleven months 131 avocado plantings have been visited, and over 5,000 miles traveled. With one exception, the reception I have received as representative of the Avocado Association has been cordial.

Making a census of the avocado trees of the State has demonstrated what we knew before, but did not so fully realize, how much we still have to learn about the avocado, where to plant, what to plant in each particular location and the care under the varying conditions of soil and water and climate. Of the earlier plantings many are wiped out entirely. They were planted in the wrong place, they were poor trees, or the owner, through ignorance or carelessness, did not give them the proper care. Most of these original plantings were of varieties which have now been discarded and many are being top-worked to the recognized better varieties of today. A few of the courageous planters of the early days are beginning to reap the reward of patience. The Taft trees

are coming into bearing. A few of the top-worked orchards are bearing. The avocado industry of California is still an infant. The oldest budded orchards are about ten years old and they are very scarce. The people who are planting today, with the experience of the pioneers behind them, are indeed fortunate.

There were, previous to this spring's planting, about 45,000 avocado trees growing in California. The aggregate sounds like a good many, but when it is considered that they are scattered in small plantings from National City to Yuba City and that more than 50% of them will never make commercial orchards, the acreage is not very large.

Today there are five recognized commercial varieties of avocados, probably not the ultimate best commercial kinds, but so good that one may feel satisfied that they will always bring good returns. However, even in these five varieties there are many variations, some strains bearing well, others very poorly. We still have to find which are the best trees for propagating. This can only be done through keeping individual records. Part of my work for the past year has been to induce the growers, for their own benefit and for the benefit of the industry as a whole, to keep records of their trees. Until a grower can be made to realize that half his orchard might be worth twice as much to him five years from now if he knew which are his drone trees and could work them over into paying ones, keeping individual tree records looks like a laborious and expensive task. Avocado records can not be kept like orange records as the fruits can not all be picked at one time, or even at stated intervals like the lemons. The keeping of records may however be a very simple matter. Fasten a tag to a tree before the picking begins and mark on it the date and amount of each pick. Number the tag to agree with the tree number, and when the fruit is all picked gather the tags. For the planting of the future this work is very important. It will take some years to make records that will furnish sufficient data to warrant the term pedigreed buds, but in the meantime the selection of buds from the best of the present trees is necessary. It will mean a difference of many years and of thousands of dollars in the development of the industry.

There were something over 100,000 seeds planted last fall. There will be something more than 100,000 buds used during the year, and it would require the services of a competent man to select and cut buds during the budding season if this work were done by the association. Some of the nurserymen objected to paying 2½c per bud above the owner's price, which was the price set by the board of directors to partially cover the cost of collecting the buds. These facts, together with the experience of the nurserymen's bud selection department under Mr. Scott, caused the directors to decide that it would be wiser for the association not to attempt to sell budwood to any extent until sufficient records have been made to offer pedigreed buds. Consequently, our sales of budwood have not been large. However, we are getting records started in a number of orchards.

In spite of the extra expense this year, our balance in the bank is somewhat in excess of what it was at this time last year.

The work has been interesting, to some degree disappointing, as many new enterprises are, but when my year's work ends on the 20th of this month, we may feel satisfied that we have made very considerable progress during the year.

R. AGNES McNALLY, Secretary.

FINANCIAL STATEMENT
CALIFORNIA AVOCADO ASSOCIATION
April 30, 1921

Balance on hand April 30, 1920.....\$1,582.76

Receipts:

Dues, 1920.....\$ 490.00		
1921..... 1,405.00		
1922..... 5.00	\$1,900.00	
Advertisements in Report.....	367.50	
Budwood	178.30	
Donations	27.75	
Reports sold	14.00	
Fruits sold	27.10	
Circular No. 2 sold.....	35.00	
Refund by Pasadena Hotel.....	100.75	
Recipe booklet	84.60	
R. M. Teague	500.00	\$3,235.00
		<hr/>
Total Receipts		\$4,817.76

Expenditures:

Convention expenses, 1920	\$ 348.58	
Advertising, Circular letter and Circular No. 2.....	47.50	
Annual Reports	510.49	
Budwood	70.00	
Salary of Secretary	1,080.00	
Traveling	203.69	
Fruits for Variety Committee	7.50	
Fruits for By-Products Lab.....	20.00	
Cartage	5.00	
Office Expenses: Postage, stationery, printing, tele- phones and telegrams	308.56	
Typewriter	80.00	
Recipe Booklet	123.00	2,804.32
		<hr/>
Cash on hand		\$2,013.44
J. M. ELLIOTT	Treasurer	

MEMBERSHIP

April 30, 1920	301
Removed	28
	<hr/>
	273
Added during year.....	149
	<hr/>
	422
Resigned	19
	<hr/>
	403

PRESIDENT'S ANNUAL ADDRESS

WM. H. SALLMON, CHULA VISTA

The business of the California Avocado Association since the last annual meeting has been conducted by the board of nine directors elected by the Association as follows: J. M. Elliott, Los Angeles, Dr. Lester Keller, Yorba Linda, Wm. H. Sallmon, Chula Vista, term expiring in 1921; Dr. W. L. Hardin, Los Angeles, A. F. Yaggy, Santa Barbara, Mrs. J. T. Stewart, Los Angeles, term expiring in 1922; Chas. D. Adams, Upland, S. W. Jamieson, Burbank, R. M. Teague, San Dimas, term expiring in 1923. Shortly after the annual meeting the board met and organized electing the following officers: President, Wm. H. Sallmon, Vice-president, Dr. W. L. Hardin, Treasurer, J. M. Elliott. In accordance with your instructions that a department be established for the selection of budwood and the keeping of individual tree records and that a person be employed for the work it was found desirable to combine these duties with those of secretary and Miss R. Agnes McNally was selected, establishing her office at her home in Altadena. The secretary's duties, therefore, have embraced the keeping of records, the issuance of publications, the increase of membership, the care of finances and the budwood department. Two changes occurred in the personnel of the board thru the resignations of Mr. Elliott and Mrs. Stewart. Mr. Elliott, on account of ill-health, desired to be relieved from his duties as director but offered to continue his office of treasurer and to help to the extent of his ability in attending the meetings and giving the benefit of his advice and experience, Mrs. Stewart, having sold her avocado ranch, resigned to make way for someone with a more active interest. Mr. Wm. Hertrich of San Gabriel was elected to fill Mr. Elliott's unexpired term and Mr. E. W. Camp of Sierra Madre to fill that of Mrs. Stewart. The board has held six meetings during the year, the attendance has been commendable and an unbroken spirit of harmony among the members has pervaded the discussions. At the beginning of the year the president, as in the year previous, presented an outline of activities as follows:

AVOCADO PROGRAM, 1920-1921

Some of the things aimed at:

1. Increase membership to 400.
2. Continue study of varieties.
3. Advance Department of bud wood selection.
4. Simplify and encourage keeping individual tree records.
5. Complete the listing of avocado trees planted in California.
6. List fruit supplies and market opportunities.
7. Consider steps towards establishing marketing center.
8. Recommend standard shipping carrier.
9. Extend Educational Campaign.
 - (1) Reprint "From Seedtime to Harvest," revised.
 - (2) Print circular on recommended varieties.
 - (3) Increase prepared and signed articles in the press.
 - (4) Secure data on the avocado as a food.

- (5) Secure data on uses of the avocado for medicinal purposes.
- (6) Issue recipe booklet, and how to select a good avocado and prepare for the table.

10. Urge revision of University's Correspondence course in "Avocado Culture."

11. Continue co-operation in experiments by Citrus By-Products Laboratory.

12. Devise co-operative plan to discourage stealing of fruit.

While many matters of routine and occasional matters arising from a large correspondence have occupied the attention of the Board, the items on this program have ever been before it and much thought, study and work have been expended upon them. We may review briefly some of the things accomplished and note what remains to be done.

Membership. This Association started in October, 1915, with 74 charter members whose names are printed in the Annual Report of that year. The list has been purged from time to time retaining only those who are paid up. When the present administration took office three years ago there were 161 members, increased the following year to 216, last year to 301, and it is a real satisfaction to be able to state that the goal of 400 set for this year has been attained with a safety margin, the total enrolled now being 403. The majority of the members are growers of avocados, the rest being nurserymen, scientific men and interested friends. About 100 are from Los Angeles and vicinity, about 50 from Pasadena and vicinity, 50 from the Foothill Region, 25 each from the San Diego, Santa Barbara and Orange County districts, 25 from other states, 15 from foreign countries and the rest scattering. The financial stability of the Association, as at present organized, depends upon the maintenance and increase of this list, for the income from memberships is our principal resource for meeting the expenses of management. It would be quite impossible to pay the salary and expenses of a regular secretary and the incidental bills which must be incurred if the number of paying members was allowed to fall below the mark now set. We were fortunate this year in being presented with a gift of \$500 to assist in starting a department of bud wood selection in connection with the secretary's office but we cannot depend upon generous occasional gifts. It is necessary for the directors to budget their expenses at the beginning of each year according to the estimated income and to do business strictly within that income. Laxity at this point would be fatal, for it is improbable that our members would tolerate the imposition of a tax in addition to the membership fee to make up a deficit. It behooves the directors, therefore, and especially the officers, to see to it that a sound financial policy is maintained.

Varieties. In October, 1917, the Association, thru its Committee on the Registration and Classification of Varieties, headed by Dr. H. J. Webber, issued a list of eight varieties of avocados recommended for planting in California. In August, 1920, the Committee, headed by Mr. Chas. D. Adams, issued a report in which the list was reduced to five varieties, Fuerte, Spinks, Dickinson, Sharpless and Puebla. It should be remembered that these reports embodied the results of long-continued and careful study by a group of our members in whom we repose confidence as to their ability and integrity. And it should not be forgotten that the report of the Committee in each case was, by their request, studied and approved by the Board of Directors and adopted by the members of the Association. It is a tribute to the painstaking care with which the work

was done that so little criticism has been directed at these lists. Considering the feelings of disappointment and chagrin likely to be aroused over the omission or rejection of this, that and the other favorite avocado son it is rather remarkable that more protests have not been raised over the decisions. The Committee for the year has consisted of Messrs. Chas. D. Adams, T. U. Barber, Wm. Hertrich, C. F. Kinman and L. B. Scott. They have met frequently, have visited trees of promising new varieties, sampled their fruits in season and reported their conclusions at each meeting of the directors. Very careful data has been kept by Mr. Hertrich and the reports are included in the records of the Association. With the increase of knowledge and experience the list will be revised at intervals and members who have information of value about the older varieties or promising new ones are invited to lay it before the Committee.

Budwood Selection. At the annual meeting in May, 1920, the Association voted to establish a department for the selection of budwood and the keeping of individual tree records. Following your instructions the directors accepted the generous offer of \$500 from Mr. R. M. Teague towards the salary of a person to take charge of this work and, as stated, appointed Miss McNally to include this duty with the secretaryship. We were not long in discovering that we had the cart before the horse. Emphasis had been placed upon the selection of budwood and the benefits which it would bring to all avocado growers, whereas prior emphasis should be placed upon the keeping of individual tree records, for there can be no intelligent and satisfactory selection of budwood without these records. It is not sufficient to take the word of a grower that certain trees have borne fruit abundantly of good size and quality and that others have been inferior in these respects. There are too many uncertain factors in such offhand information. One of our most respected growers, who indicated his superior trees in this informal manner for the cutting of budwood, was until recently of the opinion that since all Fuerte trees traced their origin to the parent Fuerte, one Fuerte was as good as another from which to obtain budwood. Experience has shown that the budded trees of this variety and of all others vary greatly in their performance. Just how greatly they vary, in what respects and which are the super trees can only be determined thru actual performance records kept accurately thru a period of years. The careful nurseryman who uses the buds and the grower who buys the budded stock in quantity desire assurance as to the records of the trees from which the buds are taken. Now there are very few of our growers who are keeping such records and consequently we have a rather insecure foundation upon which to build a department of budwood selection. A similar state of affairs faced Mr. L. B. Scott who came to California to manage the newly-formed Nurserymen's Bud Selection Association. He says, "The formation of the Nurserymen's Bud Selection Association of California was heralded by fruit growers, nurserymen and others interested in California horticulture as a progressive step towards the solving of the question of securing a better type of budwood, and thus assuring the public a better type of orchard tree. We were at once confronted with the problem that there was an immediate demand for budwood and, with the possible exception of a few olive and walnut records, practically no individual tree records of deciduous fruits had been secured in this state. I at once saw that it was impossible to furnish budwood to the nurseryman this season which could in any sense of the word be called 'selected.' I also realized that if my time and that of other employes of the association were given entirely to the cutting of budwood for this year's propagation that no attempt could be made toward securing a better type of budwood for future propagation. We therefore began securing estimated

records of production in a number of different orchards to see if this plan might not prove a short cut toward securing information regarding individual trees which could be used as sources of budwood. A few weeks' work along this line soon convinced us that, while some progress could be made, the only way whereby we would feel absolutely safe in stating that we were in a position to furnish selected budwood would be by securing actual individual tree records, as had been done with citrus fruits, for a series of years, and then only taking budwood from the individual trees which, after a series of years had shown themselves to be the best producers. Accordingly on July 31 the reorganized plan of work for our association was presented and approved by our directors. This, in brief, was that the entire time of the investigational staff of the association would be devoted to the securing of individual tree records for a period of three years and that no budwood would be furnished to the members of the association until three years' records had been secured, which would mean that budwood, which could be called 'selected' or 'performance record bud wood,' would not be handled by the association until 1922."

In view of such a situation, the directors decided that it would be better for the present that the Association should not sell budwood except to those requesting it; that the secretary should push the effort to secure the keeping of individual tree records; and also, if possible, keep records of where the nursery-men secure buds and the number from each source.

Marketing. No subject has received more careful study by the directors and members than the problems of marketing. From the first meeting of the Association, when addresses upon it were delivered, down to this present meeting the discussions have been continuous tho not always illuminating. Opinions range between the growers who deem it to be the duty of the Association to take their fruit off their hands and sell it for them and those who think that the problem is a personal one for each grower to face and settle for himself. Your directors have considered every suggestion which they could conceive and which has been submitted to them and are still in doubt as to the next best step. A suggestion was made that the California Fruit Growers' Exchange might handle the fruit. A committee consisting of Mr. Yaggy and Mr. Adams called upon Mr. Powell, the manager of the Exchange, and discussed the matter fully with him. The committee reported that Mr. Powell was interested but did not offer much encouragement, as to the chance of shipping thru the Exchange. He doubted if the Exchange would be legally allowed to handle more than they are already doing. If such an arrangement could be made, members would have to sell entirely thru the Exchange and the Avocado Association would have to join as a body. There was no hope of selling thru the Exchange at the present time when our shipments are uncertain, scattered and comparatively small but the question could be reopened when we are ready to sell in carlots.

The idea of renting a place in Los Angeles for selling and demonstration headquarters, with a competent person in charge, was considered but the expense of establishing and maintaining such a clearing-house appeared to be prohibitive. Reports indicated that the growers would not all agree to market thru the Association but would sell to the highest bidder, and unless the Association could handle sufficient of the fruits to control the market to a certain extent, this plan could not be made self-supporting. It probably could be made a success if an able man with unusual business ability could be secured to direct it but the funds with which to secure such a manager are not forthcoming.

The proposition to turn all fruits over to a single large retail house in several cities was found to be impracticable as the retailers declared they had no means of disposing of large supplies of surplus fruit. The suggestion that all fruit be consigned to a single wholesale house in different centers was canvassed by correspondence and personal interview. The largest of the Los Angeles firms prefers to buy the fruit outright, at the market price, but would handle large consignments on a commission of 25%, while a San Francisco house, which makes a specialty of avocados, would take all shipped to them on a commission of 10%. The independent fruit companies prefer to receive the fruit on consignment.

Unless some workable marketing plan is mapped out at this meeting, I would suggest that an all-day conference of growers be called for an interchange of ideas for it will soon be imperative for the growers as a matter of self-interest to take up some definite action. It may take a large crop with low prices to awaken us to the necessity of co-operation, but with the experience of the citrus and walnut men before us, such a severe lesson ought not to be necessary. The first requirement is to instill in our membership the will to co-operate and the oftener we can get together by ourselves as growers to exchange ideas the stronger will grow the will to co-operate and out of it will undoubtedly spring the foundation of a co-operative association for the distribution of the avocado crop. This is the solution of the marketing problem which other groups of producers in California have adopted. When our members decide to form a co-operative association for the conduct of their business, it will become necessary to confine the membership exclusively to producers who actually use its facilities, and a competent manager will be absolutely essential to success. The fundamental principles of co-operation are so admirably expounded by Mr. G. Harold Powell in Circular No. 222, University of California, College of Agriculture, that I heartily advise our growers to secure and study the pamphlet.

Advertising. The most conspicuous bit of advertising during the year was the issuance of the Recipe Booklet. This neatly-bound and carefully arranged list of recipes, showing how the avocado may be prepared and served from cocktail to ice cream, deserves wide circulation. The booklet will have its influence in popularizing the fruit and in educating the public taste. Wisdom was shown in omission as well as in contents. No recipes of cooked avocado are included, the soft pedal is used in oily dressings and emphasis is placed upon the fruit as the most complete and nourishing food product of the vegetable kingdom.

Circular No. 2 was issued containing the revised list of recommended varieties with brief descriptions. "From Seedtime to Harvest," by T. U. Barber, was not reprinted because the author decided that it should be rewritten in order to bring the cultural information down to date, and he preferred that someone in closer touch with growing operations should do this. There is need for such a primer and we pass the suggestion on to the next administration, together with a few other items of unfinished business on the year's program.

While speaking of advertising I desire to mention the interest displayed by Mr. E. C. Dutton of Anaheim. Mr. Dutton believes that publicity for his product is what the avocado grower needs and that we should be eternally vigilant to secure it at every possible opportunity. He noted that the editors of The Encyclopedia Britannica are preparing supplementary volumes for the purpose of bringing the work down to date, and that at present the avocado is disposed of in some five lines, most of that small space being consumed in the

recitation of its various names. Not a word is said of its great food value. We took the matter up with the American editor, offering to furnish the necessary information and he replied that in the new volumes they would not attempt to re-write the articles in the 11th Edition but that when a new general issue of the Brittanica is under preparation they will have an entirely new article on "Avocado." Nothing daunted, Mr. Dutton proposed that, as the Brittanica is essentially a British institution, we offer to furnish the information to the British editors. By request of the president, he prepared the letter showing that the avocado is being grown in some of the British Colonies, that its food value is fully recognized and that the late war showed conclusively how necessary it is for England's existence that every possible source of food supply be exploited to the limit. If facts, figures, good English and close reasoning can avail, we should receive a favorable reply. In any case we are indebted to Mr. Dutton for his interest, showing the desirability of learning when new issues of dictionaries and reference books are to appear and endeavoring to have adequate data on the avocado included.

When this Association reorganizes and becomes a co-operative marketing agency it will become necessary to take up the questions of advertising and publicity on a larger scale, and in this connection I wish to refer our growers to a pamphlet on Co-operative Advertising which may be obtained from the California Fruit Growers' Exchange, Los Angeles. The pamphlet, which would repay our study at this time, contains a live address by Don Francisco, advertising manager of the Exchange, in which he presents co-operative advertising as a social service as well as a powerful sales force.

State and Federal Co-operation. The revision of the Correspondence Course on Avocado Culture offered by the University of California was furthered by the appointment of a Committee consisting of Messrs. F. O. Popenoe, Chairman, E. E. Knight, T. U. Barber, W. A. Spinks, Wm. Hertrich and the president. Their report will be presented at this meeting.

Prof. Jaffa, in his researches at the University laboratory, on the food value of the avocado, and Mr. E. M. Chace, in his work on maturity standards at the Citrus By-Products Laboratory, should have our earnest support. It would require only a small part of our funds to supply these investigators with the fruits they need for experimental purposes, and it would simply be a good business investment. In addition to the problems upon which these men are now engaged, there is much to learn about the cold storage of avocados and I have reason to believe that the University would undertake some experiments if the fruits were furnished.

Our continued appreciation should be expressed to the Bureau of Plant Industry of the U. S. Department of Agriculture for their aid to our industry in the distribution of budwood and trees of new varieties. Some of the Guatemalan varieties, introduced by Mr. Wilson Popenoe, have fruited in this country and are very promising. It may be that among these varieties we shall find some that are superior to any we have now. The introductions have been handled fairly and impartially, only one complaint having been heard on this score, and that an unjust one.

Visits to Groves and Nurseries. It was the pleasure of your president during the year to carry out a series of visits to avocado plantings and nurseries. As far as possible it was planned to cover grounds not included in the field days of directors and in previous visits and to give particular attention

to viewing the work of the nurseries. A cordial welcome was received at every stopping-place and the visits were interesting and educational. There appear to be only one or two avocado orchards which might in any sense be called models. Most of the older orchards which still exist are suffering from a wrong start with varieties which have proved to be of little or no value. Many show evidences of lack of care due to different causes, among which may be mentioned lack of knowledge of cultural methods, scarcity of labor, shortage of water or infrequent application. In some places the depredations of fruit thieves are serious, and the suggestion is again tendered that the Association offer for information leading to the arrest and conviction of thieves a sum equivalent to that offered by the owner of the orchard. Posted notices of such rewards might have a deterrent effect. The trees appeared to be markedly free from signs of disease and little worry was encountered anywhere about the sales of fruit. It was estimated that after deducting fruit which was under contract or could easily be disposed of thru known channels, there would remain about 25,000 fruits for sale, mostly during the summer months, and we have been assured by the large dealers that the market would easily absorb this amount.

In the nurseries handling avocado trees there was evidence of the largest planting of budded stock yet known. An estimate of 15,000 budded trees sold and planted out this year is probably not far astray. In the largest nursery visited there were 19,000 trees under cover, 10,000 of which were budded and about 7,000 sold for the season. 30,000 seeds were planted in this nursery and 20,000 in another. It was observed that the majority of nurserymen are avoiding pots and boxes and are planting in the open ground, that they are planting chiefly the varieties recommended by the Association, that they prefer to do their own cutting of budwood from selected trees and that they are selling at reasonable prices averaging about \$3.50 per tree by the hundred, or \$4.00 to \$5.00 each in smaller lots. The nursery business is quite dependent upon the Association for its prosperity. Without our meetings, publications and organization there could be no thriving avocado nursery business. Its extent gives rise to the question whether the market is likely to keep pace with the increase of our products. Some have misgivings at this point and think that as the increased acreage comes into bearing the result will be large crops with low prices or no sales and consequent loss. This is but a challenge to the leaders of the industry to see to it that the merits of the avocado are so widely and wisely advertised that the demand will keep pace with the supply.

In closing, I desire to extend thanks to all who are co-operating for the success of the Association and the establishment of the industry and to express my heartfelt appreciation of the team-work and devotion which have characterized my associates on the Board of Directors during the three years in which you have honored me with the presidency.

REPORT OF THE COMMITTEE ON REGISTRATION AND CLASSIFICATION OF VARIETIES

Numerous requests have reached the committee to mention a variety of the Mexican race of Avocados, equally hardy with the orange, that would be satisfactory for home use in door yard planting in places where it would be too cold to raise the Guatemalan varieties. The Ganter has stood this test well for a number of years. The tree is vigorous, precocious and productive. The fruit is one of the largest of the Mexican type, averaging half a pound in weight, of a green color and in quality and flavor extremely good. Its defect, a frequent cracking or decay spot at the blossom end, does not interfere with its home use and can be largely prevented if the fruit is not allowed to remain on the tree after it reaches maturity.

There has been expressed a desire for the discovery of a good Mexican fruit larger than those with which we are familiar in California. Such a one came into bearing last Fall, producing a handsome fruit weighing a pound, black in color and of very fine flavor. It is growing in a frost free location, so we can only assume, until tested elsewhere, that it will be exceptionally hardy, like the other Mexican kinds. It is believed to be identical with the Gottfreid introduced by the U. S. Government into Florida some years ago. This tree is growing on Mr. Spink's place, where he has also under observation a Mexican seedling, which he has named the "Mission" and which produces a fruit nearly as large, of equally fine flavor, pyriform in shape, black in color, with a moderately small seed that is tight in the seed cavity, clear yellow flesh and no fiber. Some of the fruit comes late enough to be exhibited at this meeting.

It is a surprise and pleasure to learn in how many places and to what extent Guatemalan seedlings are being grown with the hope of finding fruit of value to the industry. There are three separate places, in each of which, over a hundred such trees are under care and observation, and numerous other places having trees under similar care. We are getting good results, as our report will show. In addition we have a sure gain to the industry from the fruiting this year in California of twelve out of twenty-four Wilson Popenoe introductions through the U. S. Government from Guatemala.

On the invitation of Mr. Spinks, the Varieties Committee, by its three active members assisted him on April 24th in picking and verifying the identity of these varieties, preparatory to his exhibiting them and cutting them at this meeting. All were sufficiently advanced to show they correspond superficially to the government description, although only one, the Kanola, has matured and been tested. The others are named as follows: Nimlioh, Benik, Mayapan, Cabnal, Ishim, Manik, Lamat, Cantel, Pankay, Ishkal, Tertoh. The Kanola is a heavy bearer of a round deep purple fruit, six to ten ounces in weight, with a very thick rough skin, a small seed and yellow flesh of rich flavor. A sample of this fruit from Mr. Shedden's place, submitted to Messrs. Chace and Church on March 24th for analysis, gave the following result:

Total weight of fruit, 220 grams—approx. $7\frac{3}{4}$ oz.

% of pulp or edible matter	63.60
% seed	12.30
% skin	23.70
% water	70.22
% fat	21.92

% protein	0.96
% total sugars	0.49
% ash	1.32

Of the seedlings that have come into bearing on the Spinks place five are considered especially promising, all having fruit from a pound to a pound and a half in weight. The one considered the most interesting has been named the "Alexandria." This fruit proved very fine in quality and flavor with a very small seed and the tree is a strong grower.

Among a good many on the Huntington Estate, No. 46 is the most interesting, having very rich fruit.

On the Oakley place at Brentwood Park are a number of fine flavored Mexicans; Nos. 1, 2, 3 and 4 being the more prominent among his Guatemalans.

On the Stephens place at Montebello, his Nos. 1 and 2 test out well. At his place and also at La Habra and Whittier the No. 15 introduction of Stephens and Rideout has been on trial for several years, producing a fruit of extra fine, rich, nutty flavor, but too many of the fruits have the undesirable crooked, curved neck and the tree is too long in coming into bearing. The value of their introduction No. 2 is still undetermined.

We have examined interesting trees and fruit on the properties of Willard Smith, Villa Park, Mrs. Ida Shaffer, Pasadena, Dr. Miles, Alhambra, Mrs. Titus Phillips, Alhambra, C. F. Wagner, Hollywood, and others.

Some good fruit measure up so well otherwise to the desirable qualities required in a good avocado, that we regret when we find them disqualified for general use by the presence of a seed much too big and out of all proportion to the size of the fruit. Such fine fruits are the California grown by Milo Baker at Hollywood and the Cady by L. D. Cady, Los Angeles.

Two of the original West India Garden introductions have come into bearing with fine fruit maturing in the Spring. The Montezuma, a green fruit with a thick granular skin, dull yellow flesh, free from fiber, or with only a very slight discoloration, flavor of the best, good and rich, weight of one sample, 18 oz., seed 3 oz.; and the other fruit, the Schmidt, with a green color, thick skin, deep, clear yellow flesh, free from fiber and the flavor smooth and rich; weight of one sample 20 oz., seed 2 oz.

At our Fall meeting many fine fruits of the No. 1 Seedling, cut and tested by H. Hamburg, were exhibited. It is a variety which he has now decided to call the "Quaker." The strong growing tree, ten years of age and thirty feet in height, with spread of twenty-five feet, comes from a seed sent him from Guatemala. It had a crop of a few the previous year and fifty in 1920. Buds taken from it and put into other stock have taken well and made strong healthy growth. The fruit is large, green in color, up to a pound and a half in weight, with seed of medium to small size, thick skin, clear cream colored flesh and excellent flavor and quality, a slight bitterness showing in one test.

The Anaheim, from a tree grown by E. C. Dutton at West Anaheim, on property now owned by Otto Keup, was exhibited at the last annual meeting, and five fruit were afterward tested by the Committee. They ranged in weight from 24 to 18 oz., and the seed from $3\frac{3}{4}$ to $2\frac{1}{4}$ oz. The fruit was light green in color, with a thick skin and attractive appearance, clear yellow flesh with a very small amount of fiber discoloration and good rich flavor in three specimens. The other two were not so good and were thought to be immature.

The Hoff, grown by J. E. Hoff at Hollywood, is a large strong tree from a seed planted in 1911. It had a few fruit in 1916 and 1917, in 1918 it had 35 fruit, in 1919 fifty, in 1920 100. The fruit is pear shaped, green in color, with a thick skin, weight 12 to 20 oz. with a small seed. It matures in the Fall, but remains on the tree without dropping. The fruit tested was picked January 14th, sampled January 20th, and found to be in excellent condition. It weighed 16 oz., seed $2\frac{1}{2}$ oz. The color of the flesh was a clear bright yellow, with no fiber and the flavor and quality extremely good. The following is an analysis of this fruit made by Mr. Chace.

	Date	Sp.Gr. of	Seeds	Pulp	Skin	Water	Ash	Protein	Fat
No.	1920	fruit	%	%	%	%	%	%	%
142	11-15	1.0013	17.46	76.17	6.28	71.13	1.51	2.23	18.47

The Billingsly. A large tree on the property of Ray Billingsly, Villa Park, Orange County. A spring fruit weighing 10 to 16 oz. Weight of three fruits sampled 10 1-2, 13 and 16 oz., weight of seed 1 5-8, 1 3-4 and 1 3-4; fruit pear shape to oval, color light yellowish green, turning partially brown; flesh clear, bright yellow with merely a trace of fiber, quality excellent, with a good, rich and agreeably distinctive flavor.

The Butternut from a budded tree on the Ferguson place, North Whittier Heights, and introduced by Edwin G. Hart from Southern Mexico, tested March 6th, 1921; weight 12 oz. Seed 2 oz. Shape round oval, skin thick, granular inside, leathery outside, color dark red, smooth and glossy with a finely webbed appearance; attractive looking; flavor and texture good.

The Monroe on the place of B. H. Sharpless at Santa Ana is a green pear shaped fruit of fine appearance and good flavor and quality, weighing 14 to 18 oz., a moderate sized seed and clear yellow flesh. The tree is a good bearer.

The Knight variety has come into bearing with another fine fruit added to the credit of the introducer of the Queen and Linda. It is a very promising round green fruit. The fruit as well as the tree have excellent appearance and as to quality it is still under observation.

The Queen and Linda have been so widely planted that we are now receiving valuable information concerning them from a large number of growers. We find that differences of opinion exist as to the merits of these fruits.

The Sherman Seedling No. 1, grown by E. Goodell Sherman, Hollywood, comes from a seed brought from Honduras and planted in 1910, according to an old diary of Mr. Habersham. Eight fruit, maturing this Spring, form its first crop. They are very large and handsome, weighing from 20 to 30 oz., with seed from 3 1-2 to 4 1-2 oz., of an elongated pyriform shape and smooth yellowish green leathery skin. The seed in some of the fruits is slightly loose in the cavity, and the flesh is yellow with a very little fiber discoloration, not enough to be objectionable, remarkably smooth in quality and the flavor very fine and agreeably rich. The character of the wood growth in young trees is now on trial in several orchards.

The Lyon. The description of the Lyon given in the last annual report of the Committee applies equally today. The report is absolutely correct, fair and impartial and can easily explain how the extreme difference of view arises as to the value of the Lyon. It has none to those who have lost quantities of weak young trees and find shriveled fruit under those that remain. On the other

hand the remarkably large crops it produces, per tree and per acre, cause others to believe these troubles can be conquered and the variety become the poor man's friend, as a Monrovia grower calls it. Mr. Rideout has found that a sport or a bud variation has produced for him a selected tree, different from the others, maturing its fruit earlier and in tests to date giving healthy young trees. A fruit picked from this tree in January, 1920, was sampled by some of the Committee the first week in February and the flavor found to be good.

The Dickey A is on the market, attractive in appearance and confirming its previous reputation of the possession of a fine rich flavor and a very small seed.

Three varieties claim consideration as winter maturing Avocados: the Dutton, the Tiger and the Dorothea.

The Dutton, grown by E. C. Dutton at West Anaheim on the place now owned by Otto Keup. Tree vigorous and productive, with the crop off the tree before the following season's blossoms appear. Crop matured from January onward last year, February onward this year. Fruit large, a pound or over, shape pyriform, color purple, skin thick and granular, seed medium to large. Two fruits sampled in March, 1920, weighed 15 oz. each, seed 3 oz. and 2 3-4 oz. They doubtless were over-ripe, as the flesh was dull yellow with discolorations around the seed, some fiber and flavor only fair. No samples were available this year, the fruit not being obtainable at proper maturity. Two other tests, made in March, 1920, from fruits picked in February, bring different and very favorable reports. Mr. Kinman writes he found the fruit submitted to him exceedingly palatable and first-class in every way, seed a little large but not excessively so, and a little fiber at the blossom end. Dr. Coit writes he took the samples to Prof. Jaffa for analysis and testing and they found the fruit of "good size, texture and quality, and it in every way gave us a favorable impression. I was particularly pleased with the flavor. I think you are warranted in feeling proud of the fruit." The analysis showed 16.2 per cent of fat.

The Tiger, grown by Clair Bishop at Highland. Tree an upright grower and heavy bearer of fruit, weighing from 10 to 16 oz., and maturing from January onward. A sample fruit picked February 20, weighed 10½ oz., seed 2 oz. We find the seed ranges from 2 to 4 oz. It is a fine looking pear shaped fruit, with a rough thick skin, purple in color, flesh clear light yellow, of an average Avocado flavor. Some fruit showed considerable brown fiber. This tree was produced from a seed received in 1914 from J. H. Walker of Hollywood and had a crop of 200 fruit the present season. It has originated further inland than any other variety of which we know and stands the hot dry air of the interior valleys admirably, much better than other Guatemalan varieties growing near it.

The Dorothea, grown by W. A. Miller, Hollywood, from a seed of the well known Miller tree is believed to be a cross with one of the Mexican race. The tree is vigorous and productive. Crop 1918, 16 fruit; 1919, 30; 1920, 250. It blooms January and February, ripens mainly in December and January. Three samples, picked and tested in January weighed 12 oz., 8 1-4 oz. and 8 oz., the seeds respectively 1 oz., 1 oz., 1 1-4 oz. Color light green with many yellow spots, skin leathery, flesh clear, attractive yellow, of good texture, no fiber and excellent flavor.

The Committee report is based not alone on our own judgment, but also on the different Avocado growers covering all parts of Southern California.

Letters for the Committee or samples by parcels post for testing should be sent to the Chairman at Upland.

CHAS. D. ADAMS, Chairman.
T. U. BARBER,
WM. HERTRICH,
C. F. KINMAN,
L. B. SCOTT.

The Board of Directors recommend that the members give the five varieties of the standard list recommended by the Committee careful consideration in their planting, as there is a possible chance at the present time of over planting some of the new promising varieties, none of which have been in bearing under various conditions long enough to justify recommending them with safety on the standard list. Most of these varieties mature their fruits during spring and summer. We wish to advise to plant cautiously along this line because it will lead to an over crowded market condition at a time when prices are somewhat lower than late fall and winter.

LIST OF RECOMMENDED AVOCADO VARIETIES WITH BRIEF DESCRIPTIONS

Varieties	Season Dates, Inclusive	Wt. of Fruit in Oz.	Wt. of Seed in Oz.	Shape of Fruit	Color of Mature Fruits
Fuerte.....	Jan. to April	14 to 20	1½ to 2½	Obovate to pyriform	Dull Green
Spinks.....	March to Oct.	16 to 20	2 to 3½	Obovate to pyriform	Purp. Black
Dickinson.....	May to Sept.	10 to 16	1½ to 3	Pyriform	Dark Purple
Sharpless.....	Sept. to Jan.	16 to 20	2 to 3	Pyriform	Dark Purple
Puebla.....	Nov. to Jan.	6 to 14	1½ to 2½	Pyriform	Dark Purple

FURTHER WORK ON THE MATURITY OF AVOCADOS

C. G. CHURCH AND E. M. CHACE

Citrus By-products Laboratory, Bureau of Chemistry,
United States Department of Agriculture

The work reported to your Association this year consists of the results of the systematic analysis of monthly samples of the fruit of the eight varieties of avocados recommended for commercial planting by the Association at the time the work was started. The data are fairly complete in all but a few cases. Wind storms, theft of fruit and the difficulty of locating a satisfactory tree for sampling have reduced the number of samples in a few varieties. The purpose of the work is to ascertain whether or not maturity of the fruit can be judged from these analyses.

Methods of Sampling

The trees used for sampling were as follows: A Fuerte at Yorba Linda, a Taft at Yorba Linda, a Sharpless at Tustin, a Lyon at Whittier, a Dickinson at Chula Vista, a Spinks at Duarte, a Puebla at San Fernando and a Blakeman at Altadena. It would have been better for the purpose of the investigation if all the trees could have been located in one planting, or at least in one district. At this time, however, this condition was impossible of attainment. The number of trees are yet too few to permit of any great latitude in the selection of locations,

so that the results must be studied with this fact in mind. Practically all of the trees used were young, strong growing specimens, bearing 25 to 75 fruits. Monthly samples of fruit consisting of from 2 to 6 avocados were taken.

When these samples were received at the laboratory, one half of the number taken were analyzed at once; the other half were carefully wrapped in paper, laid aside until the flesh had softened satisfactorily, and then subjected to analysis. If for any reason, either analysis had to be delayed, the samples were kept in cool storage (from 35 to 45° F.) until used. In the text, the samples analyzed at once are referred to as hard samples, while those not analyzed until they had softened are called soft samples.

In preparing them for analysis, the fruits were weighed first in air and then under water, and the specific gravity calculated. They were then halved, the seed carefully removed and the flesh scraped from the skin with a spoon. In the case of immature fruit, where the analyses were made before the flesh had softened, this separation was very difficult and in a great majority of cases, the skin was removed by paring with a knife. The skin, seed and flesh were each weighed and their proportion calculated.

The flesh of the fruits was finely ground by passing through a food grinder repeatedly, and the following determinations were made upon it: Water, ash, protein, fat, sugar and crude fiber. The methods of the Association of Official Agricultural Chemists were used and need not be further described, except to say that water was determined by mixing the pulp with asbestos fiber and drying in vacuo at 70° C.

Significance of the Determinations Made

The specific gravity of the fruit chiefly indicates its texture or compactness. Avocados with loose seeds and hollow centers have a low specific gravity.

The moisture which the fruit contains is not indicative of its quality as far as our observations go; green fruit contains more water than ripe, for, as the proportion of fat increases, the proportion of water decreases.

So far as the study of maturity goes, ash is a relatively unimportant constituent of the avocado. It has, however, some importance when food values are considered. Protein is a very important food material and occurs in unusual quantities for a fruit, but does not vary greatly as the avocado matures.

Fat is the characteristic constituent to which the fruit owes its popularity. It must not be thought, however, that fat alone is the determining factor in the quality of a variety. The amount of this constituent increases rapidly as the fruit matures, and affords one basis for the study of the maturity.

Sugar is relatively not important, but is extremely interesting both on account of its constitution and its disappearance as the fruit matures.

Tables I to IX

Discussion of the Data

The data derived from the analysis of the samples are presented in nine tables. For better comparison, the hard samples and soft samples picked at the same time are grouped in the tables. In order to better compare the varieties, a table is also given showing the composition of each variety at the time of its maximum fat content. The results in this table are from the fruit that had been stored until soft. A figure is also given which illustrates the changes in fat content of each variety as it matures.

A discussion of the data naturally divided into two phases: first, a comparison of the composition of the varieties, and secondly, a discussion of the time of maturity of each.

Composition of Varieties

In comparing the varieties, it is hardly fair to take the averages of all the samples examined, as where the trees contained a large number of fruits, the analyses were started earlier in the season than where the fruit was scarce. The averages from fruit of these trees would for this reason be lower than where the work began later in the season. Neither is it thought best to compare only the data obtained from samples which we judged to be commercially mature, as this to some extent would be a matter of personal opinion. If, however, the data for comparison are taken at the time of maximum fat content of each variety, then each will be thoroughly mature and probably at its best.

Table X

Summarizing the data given in the first eight tables, we find:

In weight, the varieties ranked as follows, when considered with regard to size alone: Sharpless, Spinks, Blakeman, Lyon and Fuerte, Taft, Dickinson and Puebla. The ranks were not changed when the heaviest samples only were considered. The Sharpless samples ranged close to a pound and a quarter to one and a half. The Spinks ran very close to a pound each, as did the Blakeman samples. The Lyon and Fuerte samples were about the same size, varying around thirteen ounces, although both varieties reached a pound in size at times. The Taft and the Dickinson were only slightly smaller than the Fuerte and the Lyon, and both at times also reached a pound in size. The Puebla samples with one exception were less than half a pound in size.

In percentage of edible matter or pulp, the Fuerte and the Sharpless outrank the other varieties, both having about 80%, and both having a maximum close to 85%. The Lyon, the Blakeman, the Puebla, the Spinks and the Taft average above 70%, while the Dickinson, owing largely to its thick skin, has but 65%.

The Puebla and the Fuerte both have very thin skins, less than 7%. The Blakeman, the Spinks and the Sharpless are next in rank, having less than 10%, while the Taft and the Lyon are slightly above that amount. The Dickinson has close to 20% of its weight in skin.

The Sharpless, the Fuerte and the Dickinson have smaller seeds than the other varieties, averaging between 10% and 13%. The Lyon, the Blakeman and the Taft average from 15% to 17% seed, while the Spinks runs close to 20% and the Puebla slightly above that figure.

The Lyon, when mature, contains considerably more protein than any of the other varieties, averaging above 2.50% and having a maximum of over 4%. The Spinks, the Puebla, the Fuerte and the Blakeman when mature contain over 2.00%, while the Sharpless, the Dickinson and the Taft are below that figure.

The Fuerte ranks first in oil content, having a maximum of nearly 30%. The Lyon and the Puebla both have over 25%, while the Blakeman is slightly over 20%. The Taft, the Spinks and the Sharpless have between 18% and 20% fat, and the Dickinson below 15%.

The Taft has less fiber than the others, averaging less than 1.00% ; the Sharpless, the Spinks and the Lyon have between 1.00% and 1.25%. The Blakeman, the Dickinson, the Puebla and the Fuerte average between 1.25% and 1.50%.

Discussion of the Time of Maturity of the Varieties

In order to better study the time of maturity, a figure showing the change in fat content has been arranged. A glance at this figure will reveal the fact that the fat content of the avocado increases rapidly as the fruit matures; that after the fruit is matured, the increase is very slight, and that at times there is even an apparent decrease. Decreases, however, are slight and it is probable that they are due to individual variation.

Considering the graphs of the different varieties, it is seen that the rapid increase in fat in the case of the Fuerte ceases in December. For the three months ending at that time the increase in fat had been approximately 17%, while for the next four months it increased but 2%. From our notes made at the time of analysis, we find that in November, we were doubtful of the maturity of the sample, but in December, the samples had "the general appearance of being mature." It should be remembered that the samples came from a very favorable location at Yorba Linda.

Unfortunately in the case of the Puebla tree, the wind storms and pilfering had reduced the number of fruits to such an extent that the samples were exhausted in March. From the analytical data, however, it would seem that the increase in fat ceased in February, for the March sample shows a slight decrease. Up to this time, the increase had been steady, rising 17% in four months. Other indications point to the fact that the fruit was not quite mature in December, but had reached maturity at the time the February sample was taken, on the sixth of the month.

The Lyon sample reached the maximum content of fat in May. From October to May, seven months, there had been an average monthly increase of 3% in fat content. After May the samples show slight variation in fat, but no increase over the May sample. From other indications from the analyses and notes, it would appear that the fruit from this location was mature in April, at which time the stored sample contained 23% of fat.

Unfortunately the Blakeman fruits were removed from the tree before the sampling had been finished, and the data are incomplete. The samples were still increasing in fat when the last one was picked in May. The fruit from this location was not mature in February. There are some indications, however, that it might possibly have been satisfactory to market in March, and there seems little doubt that the May sample was satisfactory.

The work on the Spinks variety began well in December, but no further samples could be secured until March. Later in the season, the remaining fruit on the experimental tree was stolen, so that the July, August and September samples were from a neighboring tree. The only conclusions which can be drawn from the data are that the fruit from this location was not mature in December, but was fairly so in March when the next sample was taken. Other indications also point to maturity at this time.

The sampling of the Taft began earlier than was really necessary, but was carried out until no doubt of the maturity of the fruit could be entertained. The maximum fat content was reached in May after which there was a sharp decline in the sample taken in June. Indications are that the fruit was fairly mature in April.

Sampling on the Sharpless began in April, but it would have been more satisfactory to have begun earlier. The maximum fat content was reached in May and other indications pointed to the fact that the fruit was commercially mature the first month the sample was taken. The sampling was continued until September, and at that time there had been little if any lowering of the fat content or quality of the fruit.

Again in the case of the Dickinson samples, the fruit was stolen from the tree before the sampling was finished. The fat had increased 3% in the time elapsing between the May and June samples. From other data, it would seem that the fruit was mature at the time this sample was taken.

Examination of the tables does not reveal any other changes during growth that are nearly so uniform or marked as that of the fat. Probably the next most striking change is in the sugar content. There is always less sugar in the mature fruits than in the green. At best, of course, the fruits contain but little sugar, so that the changes are less uniform than with the fat.

With most of the varieties, there is also a slight increase in protein as the fruit matures. This is of course more noticeable where the sampling began early in the season and continued until the fruit was fully matured.

Moisture of course decreases as fat increases, and there is also a slight rise in the proportion of edible matter as the fruits mature, the proportion of skin and seed usually becoming smaller.

Miscellaneous Samples

Six miscellaneous samples have been examined since the last report was made to the Association. Four of these were from seedling trees raised by Mr. Oakley and are deserving of attention owing to the fact that they apparently mature at a time when many of the other varieties are not available. With the exception of No. 4, the fruits averaged close to a pound each, and with the exception of No. 2 contained a satisfactory amount of fat. Sample No. 1 was probably mature at the time of analysis in September, but the data on No. 2 would be in better shape if another sample had been taken a little later in the season. The seed in No. 3 had started to sprout and the fat content of No. 4 would seem to indicate maturity. Nos. 1, 3 and 4 are high in protein. The per cent of edible matter in No. 3 was also higher than is usually found.

Mr. Hoff of Hollywood also sent a seedling about 14 ounces in weight and containing $18\frac{1}{2}\%$ of fat with $2\frac{1}{4}\%$ of protein.

An analysis of one of the Department of Agriculture's Guatemalan importations grown by Mr. Sheddon of Monrovia is also shown in the miscellaneous table. This variety is the Kanola, S. P. I. No. 43560. The fruit is small, round in shape, weighing about 8 ounces, and having a very heavy skin. The fat content is satisfactory but the fruit is decidedly deficient in protein.

In closing, I might say that the Laboratory stands ready to assist with analyses of new varieties, and it is suggested that its facilities be used for the study of their composition before they are made standard. It is especially desired to secure samples of the Department of Agriculture importations for analyses. Where new and promising varieties are to be sampled, it is preferable to make an appointment so that some one from the laboratory can see the fruit on the tree and take such notes as are necessary.

FIGURE 1
Monthly Variations in Fat Content

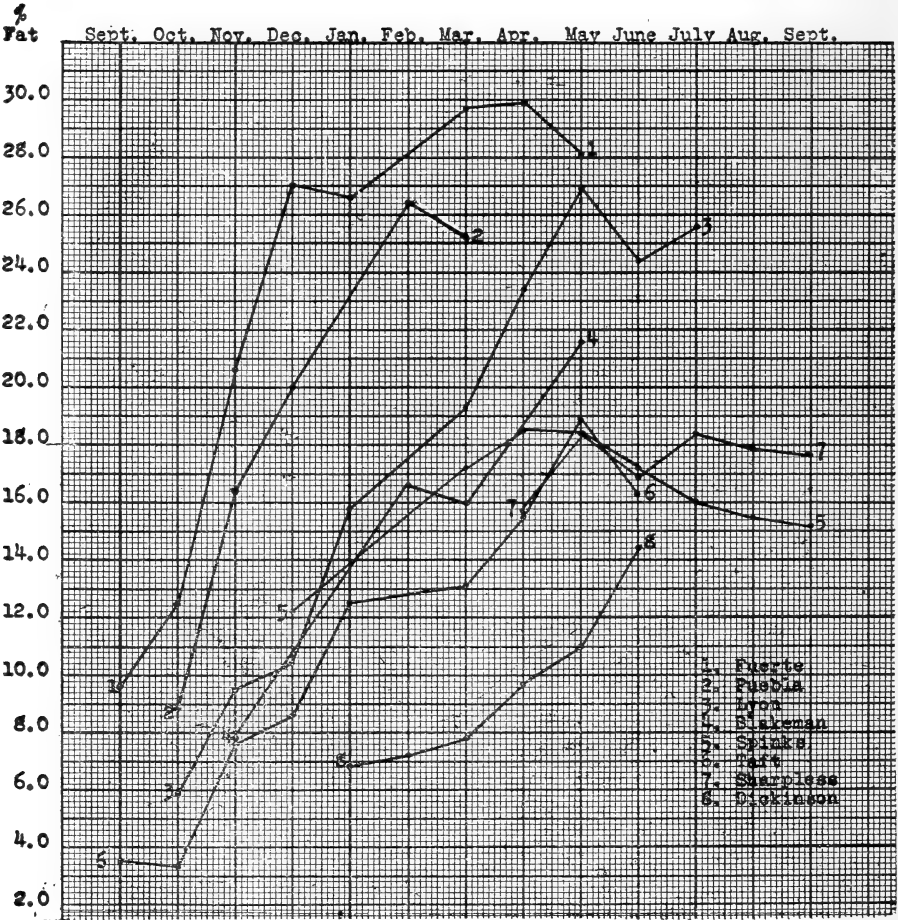


TABLE I.
ANALYTICAL DATA ON BLAKEMAN AVOCADOS

No.	Month picked	Analyzed	Av. Wt. oz.	Sp. Gr.	Pulp %	Skin %	Seed %	Moisture %	Ash %	Protein %	Fat %	Total Sugars %	Crude Fiber %	Un- deter- mined %
42.	Nov.	After storage	10.9	.9636	73.1	12.6	14.1	84.37	0.87	1.11	7.83	1.76	1.24	2.82
69.	Feb.	Immed.	14.3	.9915	76.8	12.9	9.9	75.67	1.38	1.01	13.93	1.69		
70.	Feb.	After storage	13.1	.9868	74.4	10.7	14.7	75.77	1.50	1.22	16.56	0.82	1.25	2.88
81.	March	After storage	16.5	1.0085	74.6	9.4	15.7	76.16	1.22	1.03	16.04	0.70	1.25	3.60
107.	May	After storage	18.2	1.0188	76.4	6.7	16.9	69.14	1.61	2.25	21.55	0.49	1.53	3.43

TABLE II.
ANALYTICAL DATA ON DICKINSON AVOCADOS

No.	Month picked	Analyzed	Av. Wt. oz.	Sp. Gr.	Pulp %	Skin %	Seed %	Moisture %	Ash %	Protein %	Fat %	Total Sugars %	Crude Fiber %	Un- deter- mined %
59.	Jan.	Immed.	11.6	1.0173	65.3	22.8	11.2	84.84	0.90	0.79	4.17	3.50		
60.	Jan.	After storage	10.6	.9428	68.4	21.9	9.5	86.47	1.20	1.01	6.84	0.37		
71.	Feb.	Immed.	11.2	1.0159	65.0	24.5	10.2	84.23	0.94	0.79	5.87	2.80		
72.	Feb.	After storage	9.7	.9753	67.6	19.7	13.0	86.10	1.02	0.94	7.20	0.55	1.34	2.85
83.	March	Immed.	11.4	1.0160	62.0	25.1	12.3	83.95	1.03	0.94	6.15	2.52		
84.	March	After storage	10.2	.9540	66.7	20.6	12.7	85.40	1.19	1.31	7.80	0.58	1.30	2.42
95.	April	Immed.	11.6	1.0063	62.0	23.3	14.3	84.56	1.23	1.37	7.63	0.67		
96.	April	After storage	10.5	.9650	65.8	20.8	13.1	84.71	1.12	1.31	9.68	0.36	1.19	1.63
110.	May	After storage	13.4	.9858	68.5	18.9	12.7	81.03	1.28	1.40	10.96	0.46	1.26	3.61
120.	June	Immed.	16.0	.9892	70.2	18.8	10.9	75.41	1.41	1.90	14.06	1.16		
121.	June	After storage	11.2	.9770	60.1	21.4	18.5	75.82	1.56	1.66	14.45	0.57	1.68	4.26

ANALYTICAL DATA ON FUERTE AVOCADOS

TABLE III.

No.	Month picked	Analyzed	Av. Wt. oz.	Sp. Gr.	Pulp %	Skin %	Seed %	Moisture %	Ash %	Protein %	Fat %	Total Sugars %	Crude Fiber %	Un- deter- mined %
23.	Sept.	Immed.	8.9	.9958	73.4	11.0	14.6	81.69	0.72	1.50	6.97	3.06	1.27	4.79
24.	Sept.	After storage	5.7	.9969	76.9	9.5	13.0	82.33	0.80	1.66	9.61	0.69	1.48	3.43
31.	Oct.	Immed.	11.5	.9921	77.6	8.3	13.5	78.35	0.76	1.44	11.32	2.12	1.35	4.66
32.	Oct.	After storage	10.1	1.0099	77.8	6.2	15.4	78.97	0.91	1.75	12.46	1.02	1.50	3.39
46.	Nov.	Immed.	11.2	.9864	78.0	7.7	13.8	72.72	1.02	1.55	17.61	1.08	1.32	4.70
47.	Nov.	After storage	10.2	1.0075	76.4	6.4	16.7	70.93	1.24	1.88	20.57	0.71	1.62	3.05
52.	Dec.	Immed.	12.2	.9764	77.1	8.3	14.1	67.42	1.17	1.71	23.99	0.58	1.47	3.66
53.	Dec.	After storage	10.0	.9810	80.5	6.8	12.5	64.18	1.69	1.99	26.99	0.57	1.64	2.94
62.	Jan.	Immed.	13.9	.9728	76.5	7.7	15.2	65.99	1.24	1.49	25.12	0.38	1.33	4.45
63.	Jan.	After storage	12.6	.9967	79.4	6.3	13.9	65.31	1.25	1.49	26.62	0.29	1.44	3.60
76.	March	Immed.	16.7	.9616	79.9	7.7	11.9	63.93	1.34	1.73	26.13	0.17	1.08	5.62
77.	March	After storage	14.7	.9861	81.6	5.6	12.7	62.08	1.43	1.68	29.74	0.39	1.36	3.32
88.	April	Immed.	13.9	.9596	79.2	9.1	11.2	63.46	1.40	1.88	28.19	0.11	1.25	3.71
89.	April	After storage	13.1	.9626	82.6	7.5	9.7	62.07	1.42	2.10	29.93	0.31	1.42	2.75
97.	May	Immed.	11.4	.9688	78.9	10.9	8.5	63.94	1.41	2.32	28.06	0.28	1.35	2.64
98.	May	After storage	11.4	.9616	85.0	6.0	9.7	61.08	1.33	2.32	30.15	0.13	1.24	3.75

TABLE IV. ANALYTICAL DATA ON LYON AVOCADOS

No.	Month picked	Av. Wt. oz.	Sp. Gr.	Pulp %	Skin %	Seed %	Moisture %	Ash %	Protein %	Fat %	Total Sugars %	Crude Fiber %	Un- deter- mined %
27.	Oct.	Immed.	5.5	.9954	61.9	19.1	18.4	85.87	0.61	1.71	4.26	2.59	
28.	Oct.	After storage	4.8	.9790	65.5	15.6	18.6	85.45	0.87	2.10	5.90	1.56	2.97
38.	Nov.	Immed.	11.2	.9968	65.4	16.1	17.5	82.48	0.73	1.36	6.55	3.31	
39.	Nov.	After storage	9.1	.9144	66.7	13.8	19.4	83.13	0.81	1.71	9.52	1.81	1.82
54.	Dec.	Immed.	12.4	.9902	66.6	15.8	17.1	81.49	0.68	1.27	7.63	3.28	
55.	Dec.	After storage	9.8	.9292	69.0	12.9	18.0	80.59	0.93	1.49	10.42	2.24	3.17
65.	Jan.	Immed.	12.5	1.0052	68.0	18.2	13.5	73.20	0.96	1.93	14.01	2.92	
66.	Jan.	After storage	10.3	.9317	63.6	13.0	23.2	74.83	1.06	2.25	15.76	1.51	3.24
79.	March	Immed.	14.3	.9990	68.6	15.3	15.8	69.85	1.09	2.34	16.66	1.67	
80.	March	After storage	13.4	.9892	68.6	11.7	19.4	70.66	1.17	2.45	19.29	1.90	3.34
90.	April	Immed.	16.5	.9833	70.9	14.8	14.1	66.79	1.19	2.60	21.34	1.29	
91.	April	After storage	13.2	.9798	70.5	10.8	18.6	66.13	1.24	3.02	23.41	1.65	3.30
105.	May	Immed.	14.8	.9849	72.5	14.6	12.4	62.95	1.19	3.41	25.07	0.80	
106.	May	After storage	10.6	.9719	78.9	11.4	9.7	61.56	1.43	4.37	26.89	0.94	3.52
116.	June	Immed.	15.9	.9827	77.1	11.5	11.0	64.44	1.33	2.66	22.91	1.07	
117.	June	After storage	15.3	1.0051	76.9	9.5	13.0	64.58	1.29	3.28	24.43	0.37	4.83
122.	July	After storage	16.7	.9656	77.8	11.1	11.0	68.52	1.17	3.02	25.57	0.53	0.04

TABLE V. ANALYTICAL DATA ON PUEBLA AVOCADOS

No.	Month picked	Analyzed	Av. Wt. oz.	Sp. Gr.	Pulp %	Skin %	Seed %	Moisture %	Ash %	Protein %	Fat %	Total Sugars %	Crude Fiber %	Un-determined %
36.	Oct.	Immed.	6.9	1.0107	64.9	10.3	24.4	82.88	0.83	1.77	6.72	2.31	1.35	3.68
37.	Oct.	After storage	5.7	1.0324	67.5	6.1	25.6	80.12	1.10	2.30	8.87	2.58	1.64	
40.	Nov.	Immed.	7.2	1.0147	67.7	8.4	23.6	76.29	1.09	1.62	13.12	1.45	1.43	3.85
41.	Nov.	After storage	6.9	1.0324	67.6	5.8	26.4	73.49	1.34	2.08	16.36	1.74	1.40	
48.	Dec.	Immed.	7.6	1.0022	72.7	7.9	19.0	73.50	1.17	1.62	15.59	1.47	1.42	3.51
49.	Dec.	After storage	6.6	1.0282	71.4	5.5	22.8	70.01	1.60	2.02	19.99	0.88	1.12	3.75
68.	Feb.	After storage	6.5	1.0225	68.1	8.1	23.3	63.59	1.72	2.19	26.45	0.75	1.09	3.87
82.	March	After storage	8.3	1.0232	74.0	6.2	19.4	64.89	1.77	2.27	25.33			

TABLE VI. ANALYTICAL DATA ON SPINKS AVOCADOS

No.	Month picked	Analyzed	Av. Wt. oz.	Sp. Gr.	Pulp %	Skin %	Seed %	Moisture %	Ash %	Protein %	Fat %	Total Sugars %	Crude Fiber %	Un-determined %
56.	Dec.	Immed.	14.5	.9718	60.8	12.8	25.9	78.55	1.13	1.40	11.03	2.16	1.27	4.54
57.	Dec.	After storage	13.0	.9460	64.8	11.8	23.3	77.62	1.52	1.77	12.22	1.06	1.28	
74.	March	Immed.	15.8	.9853	64.1	12.2	23.3	76.15	1.19	1.53	14.36	1.52	1.09	4.26
75.	March	After storage	12.6	.9950	69.8	10.6	19.1	73.04	1.42	1.84	17.23	0.93	1.11	3.37
85.	April	Immed.	17.5	.9527	65.2	13.5	20.7	72.56	1.43	2.36	18.13	0.58	1.37	3.24
86.	April	After storage	18.8	1.0001	69.5	8.5	21.8	72.66	1.44	2.32	18.53	0.59	1.20	3.99
108.	May	Immed.	21.0	.9450	68.5	9.4	21.7	73.74	1.40	2.40	16.96	0.17	1.09	3.14
109.	May	After storage	19.3	.9977	73.0	7.0	19.2	72.85	1.54	2.36	18.37	0.53	1.09	3.49
118.	June	Immed.	16.9	.9403	69.1	11.2	19.3	74.15	1.24	1.79	17.03	0.42	1.37	
119.	June	After storage	13.1	1.0038	71.0	11.2	17.7	73.47	1.42	1.92	17.21	0.62	1.20	
125.	July	After storage	17.5	1.0147	64.0	7.0	29.0	75.66	1.42	1.66	16.04	0.40	1.09	
126.	Aug.	After storage	15.3	1.0152	69.5	8.9	21.4	75.27	1.53	2.70	15.54	0.62	1.09	
129.	Sept.	After storage	18.8	.9830	71.8	8.1	20.2	75.66	1.60	2.62	15.14	0.40	1.09	

ANALYTICAL DATA ON SHARPLESS AVOCADOS

TABLE VII.

No.	Month picked	Analyzed	Av. Wt. oz.	Sp. Gr.	Pulp %	Skin %	Seed %	Moisture %	Ash %	Protein %	Fat %	Total Sugars %	Crude Fiber %	Un- deter- mined %
92.	April	Immed.	18.5	.9906	75.2	13.7	10.4	77.11	1.13	1.07	14.73	1.54		
93.	April	After storage	18.2	.9312	77.9	10.6	11.7	77.34	1.23	1.37	15.68	0.58	1.13	2.67
101.	May	Immed.	16.4	.9884	72.1	15.1	12.5	76.11	1.17	1.13	16.05	0.88		
102.	May	After storage	11.7	.9501	75.1	12.8	12.0	74.57	1.38	1.27	18.41	0.60	1.14	2.63
112.	June	Immed.	18.8	.9811	75.3	13.2	11.2	76.99	1.29	1.33	15.79	0.41		
113.	June	After storage	23.0	.9255	81.9	7.9	10.2	75.83	1.46	1.31	16.91	0.40	1.12	2.97
124.	July	After storage	22.4	.9781	80.0	9.2	10.6	74.65	1.50	1.44	18.39	0.27	1.09	2.66
127.	Aug.	Immed.	26.6	.9812	78.2	11.7	10.0	73.33	1.42	1.78	18.47	0.34		
128.	Aug.	After storage	23.4	.9908	84.0	7.5	8.6	73.97	1.58	1.92	17.88	0.25	1.12	3.28
130.	Sept.	After storage	22.9	.9762	82.8	7.6	9.2	74.94	1.51	1.36	17.71	0.36	1.20	2.92

ANALYTICAL DATA ON TAFT AVOCADOS

TABLE VIII.

No.	Month picked	Analyzed	Av. Wt. oz.	Sp. Gr.	Pulp %	Skin %	Seed %	Moisture %	Ash %	Protein %	Fat %	Total Sugars %	Crude Fiber %	Un- deter- mined %
25.	Sept.	Immed.	4.8	.9870	64.7	10.7	23.9	87.97	0.58	1.23	2.20	3.60		
26.	Sept.	After storage	3.8	.9869	71.5	8.6	19.8	88.67	0.79	1.36	3.51	1.58	1.00	3.09
34.	Oct.	Immed.	7.4	1.0044	71.3	16.5	11.4	87.57	0.59	0.96	2.39	3.50		
35.	Oct.	After storage	4.9	.9460	71.8	16.4	11.8	88.67	0.67	1.16	3.34	2.04	0.73	3.39
44.	Nov.	Immed.	9.8	1.0001	70.6	17.0	11.6	84.34	0.72	0.66	6.45	2.93		
45.	Nov.	After storage	8.5	.9443	67.3	16.7	15.8	84.46	0.85	0.83	7.56	1.71	0.99	3.60
50.	Dec.	Immed.	7.9	1.0020	68.9	17.0	13.3	83.58	0.78	0.52	6.88	2.51		
51.	Dec.	After storage	8.3	.9749	70.8	13.8	15.3	83.86	1.13	0.79	8.60	1.28		
61.	Jan.	After storage	8.2	.9324	70.1	16.2	13.7	80.04	1.24	1.03	12.46	0.71	0.93	3.41
78.	March	After storage	14.4	.9927	72.0	11.7	16.3	78.87	1.11	0.79	13.12	0.68	0.97	3.55
87.	April	After storage	14.2	.9836	70.1	12.2	17.2	76.52	1.35	1.40	15.51	0.71	0.95	4.52
103.	May	Immed.	15.8	.9811	69.8	15.1	14.6	72.01	1.60	1.53	19.48	0.71		3.56
104.	May	After storage	15.3	1.0025	71.6	10.8	17.4	73.75	1.45	1.31	18.89	0.58	1.03	2.99
114.	June	Immed.	16.4	.9981	66.4	14.5	18.9	71.56	1.47	1.22	20.27	0.44		
115.	June	After storage	10.8	1.0141	70.4	11.1	18.7	76.19	1.51	1.31	16.34	0.68	0.97	3.00

TABLE IX. ANALYTICAL DATA ON MISCELLANEOUS AVOCADOS

No.	Month picked	Analyzed	Av. Wt. oz.	Sp. Gr.	Pulp %	Skin %	Seed %	Moisture %	Ash %	Protein %	Fat %	Total Crude Sugars %	Fiber %	Un- deter- mined %
Oakley No. 1—														
131. Sept.		Immed.	19.6	.9743	73.0	9.2	17.5	70.78	1.21	3.01	16.92	0.40		
Oakley No. 1—														
132. Sept.		After storage	17.2	1.0157	76.6	6.1	17.2	69.45	1.30	3.81	19.44	0.78	1.57	3.65
Oakley No. 2—														
133. Sept.		Immed.	16.8	.9523	72.3	8.1	19.2	78.24	0.83	1.94	12.07	2.04		
Oakley No. 2—														
134. Sept.		After storage	16.3	.9607	79.2	5.8	14.9	78.01	0.96	2.67	13.63	0.80	1.11	2.82
Oakley No. 3—														
135. Sept.		After storage	15.9	.9865	83.6	6.2	10.1	71.13	1.41	3.54	18.23	0.59		
Oakley No. 4—														
136. Sept.		After storage	10.4	1.0083	77.2	6.9	15.8	65.76	1.58	3.67	22.64	0.50	1.54	4.31
Hoff Seedling—														
142. Nov.		After storage	13.6	1.0013	76.2	6.3	17.5	71.13	1.51	2.23	18.47	....	1.34	5.32
Kanola—														
144. March		After storage	7.1	.9941	63.4	21.5	15.1	71.50	....	0.97	20.91	0.62	1.25	....

TABLE X. ANALYSES OF AVOCADOS AT TIME OF MAXIMUM FAT CONTENT

Month picked	Variety	Sp. Gr.	Pulp %	Skin %	Seeds %	Moisture %	Ash %	Protein %	Fat %	Total Sugars %	Crude Fiber %
May	Blakeman	1.019	76.38	6.7	16.9	69.14	1.61	2.25	21.55	0.49	1.53
June	Dickinson	.977	60.13	21.4	18.5	75.82	1.56	1.66	14.45	0.57	1.68
April	Fuerte	.963	82.58	7.5	9.7	62.07	1.42	2.10	29.93	0.31	1.42
May	Lyon	.972	78.94	11.4	9.7	61.56	1.43	4.37	26.89	0.94	1.29
Feb.	Puebla	1.022	68.12	8.1	23.3	63.59	1.72	2.19	26.45	0.88	1.42
May	Sharpless	.950	75.14	12.8	12.0	74.57	1.38	1.27	18.41	0.60	1.14
April	Spinks	1.000	69.48	8.5	21.8	72.66	1.44	2.32	18.53	0.59	1.09
May	Taft	1.002	71.57	10.8	17.4	73.75	1.45	1.31	18.89	0.58	1.03

DISCUSSION OF ANALYSES OF AVOCADOS FROM THE STANDPOINT OF NUTRITION

PROF. M. E. JAFFA

A Nutritional Review

In view of the interest that is being taken by the public in this fruit, evidenced by our station correspondence and interviews, it appeared to me that it might not be out of place to repeat some of the data which has been previously given with reference to the comparative nutritional value of the avocado and other foods.

We will first compare the avocado with other fruits and then with some of the more commonly used or staple foods.

There has been, during the last decade or so, a much fuller understanding of the nutritive value of fruits than previously existed and this is well indicated by quotations from the introduction and conclusion, respectively, of Bulletins 107 and 132 by the writer, published in 1903 by the U. S. Department of Agriculture.

Introduction. "Fruit is considered by the majority of persons as an accessory or supplementary food, eaten for its agreeable flavor or supposed hygienic or medicinal virtues, rather than as a staple article of diet. Perhaps for this reason very little scientific study has been given to fruit as compared with the investigations which have been carried on in connection with other more common food materials. Chemical analysis has shown the comparative composition of fruits, but our knowledge of their dietetic value, digestibility, and comparative cost as sources of nutrients is far from being complete. In view of these facts it has been thought best that California should undertake, as her share of the nutrition investigations made under the auspices of the United States Department of Agriculture, studies of the nutritive value and digestibility of fruit. Perhaps no State in the Union is in better condition to exploit such problems. No month in the year finds the California market without fresh fruit of local production, and many people are to be found in the State who make this article an important part of their dietary."

Conclusion. "No extended comments can be made on these results, because, as before stated, there are few, if any, similar investigations at hand for comparisons. Further investigations along this line are needed."

The further investigations suggested were carried on in 1902-3 at the University of California with most satisfactory results and two paragraphs from the summary would seem quite pertinent:

"Although it is undoubtedly advisable to wait until more data have been gathered before making definite statements regarding the digestibility of different fruits and nuts, enough work has been done to show that they are quite thoroughly digested and have a much higher nutritive value than is popularly attributed to them. In view of this it is certainly an error to consider nuts merely as an accessory to an already heavy meal and to regard fruit merely as something of value for its pleasant flavor or for its hygienic or medicinal virtues.

As shown by the composition and digestibility, both fruit and nuts can be favorably compared with other and more common foods. As sources of carbohydrates, fruits at ordinary prices are not expensive; and as sources of protein and fat, nuts at usual prices are reasonable."

It will be noticed that only the carbohydrates of fruits are emphasized, no mention being made of any other nutritional value. In order to thoroughly understand how much more complete is our knowledge of fruit and nuts today than it was in 1902 it will be necessary to briefly review the progress nutrition has made since that year.

A few years ago our evaluation of a diet was based on:

1. Content of protein.
2. Content of fat.
3. Content of carbohydrates.

If a diet contain sufficient protein in addition to the necessary fat and carbohydrates to meet the caloric requirement it was considered well balanced, without regard to the sources of the respective nutrients. Today we have a different yard stick and measure quite differently. We realize, as we did in the past, that calories are vitally necessary, but we pay more attention to the *sources* of the required calories. This is particularly true in the case of the young and growing child, and of the invalid and convalescent.

Perhaps the only nutrient which has not been affected by later theories is the starch or carbohydrates of our foods. The same opinions which were held years ago with reference to the role of starch in nutrition, are valid today. Not so, however, with reference to any other nutrient. We know today that proteins from different sources have different biologic values. The proteins from cereals, fruits, and vegetables alone are not adequate for optimum growth and development. These proteins lack sufficient amounts of certain building stones or units of structure, chemically called amino acids, which are well supplied by animal proteins, such as that of meat, milk and eggs. It is therefore absolutely necessary that there be a liberal amount of animal protein included in the diet of the young and growing animal.

The newer knowledge of the proteins has only been obtained as result of the investigations carried on during the past, say, 15 years.

Previous to such studies there was very little differentiation regarding the biologic values of proteins. It was a case of quantity and not quality. Today the reverse is true. It is the quality which must be given equal consideration with the quantity.

Not only have great strides been made with reference to the fuller appreciation of the value of proteins but also in connection with the biologic values of different fats. A quarter of a century ago all fats were considered of equal nutritional value and their main function was to build fatty and nerve tissues or yield energy, and practically no other nutritional property was credited to them. Today the situation is entirely different and we know that all fats have not the same biological value; that there are two good fats, that of milk and egg yolk, which stand out most prominently, as far as nutrition is concerned, in that they both contain the so-called fat-soluble vitamins. This is a dietary essential at present not identified, but absolutely necessary in any well balanced diet for old or young, and particularly the latter. There are many other edible fats which are the equal of butter fat and egg yolk fat as far as caloric value is concerned but they are not the rich source of this dietary essential as is noted for the other two fats.

One of the most important phases of the newer knowledge of nutrition relates to the importance of mineral elements in nutrition.

For many years it was considered that, as far as the mineral matter was concerned, almost any diet was adequate and very little attention was, therefore, paid to the role of the mineral ingredients. Today, however, as result of nutritional studies we note that our previous views and opinions were not sound and that more consideration should be given to the mineral matter of the diet than was previously supposed necessary. It is now known that cereals alone are deficient in certain minerals, such as sodium, calcium and chlorine, required for growth and normal development in the young animal. Again we know that, as a result of the work of recent years, the mineral matter of our foods may be divided into two main groups, the "acid forming" and the "base forming." It is absolutely necessary, according to the best authorities, that there be a generous representation in the diet of both these groups in order that the mineral equilibrium of the body should not be altered and the alkalinity of the blood be not disturbed.

The chief foods which furnish the "acid forming" mineral elements are, cereals, meat and eggs, while those supplying, in the main, the base forming minerals are the fruits and vegetables.

Mention has been made of milk fat and egg yolk fat containing vitamins. These were discovered by Osborne and Mendel, McCollum and others, as result of dietary experiments and the name given to such dietary essentials was "vitamine" by some, and "growth promoting substance" by others. During the past ten years much work has been done by leading nutrition investigators in connection with the studies of vitamins and their role in nutrition. The question the layman might naturally ask is, "*What is a vitamine?*" It has been known for many years that there exist in fresh food some substances which are essential for the prevention of scurvy. These are called, by some, "*anti-scorbutic substances*" (effective against scurvy). Beriberi is another deficiency disease which can be prevented by a diet adequate in *antineuritic substances*, (a remedy of service in nervous diseases), so that we have two substances, anti-scorbutic and anti-neuritic, present in foods which are evidently curative for these two diseases. Naturally there was a desire on the part of many investigators to quantitatively separate these materials from the foods. Funk and his collaborators, however, devoting much time and energy to the problem, succeeded, in 1912, in devising a method which led to a product of high physiological activity and curative powers. To this preparation Funk gave the name "vitamine," from "Vita," life, and "amine" meaning a substance essential to life.

It should be said that these unknown essentials have no direct relation to the ordinary nutrients such as protein, fats, carbohydrates and mineral matter.

The three terms, "antiscorbutic vitamine," "anti-neuritic vitamine," and "growth promoting substances" are not the only designations that have been proposed or suggested. Others are, "growth substances," "growth determinants," "food hormones," "accessory food substances," "dietary essentials," "fat-soluble vitamins," "water-soluble vitamins." It has been quite clearly shown that there are two groups of these so-called "vitamines," one soluble in fat and one soluble in water. The latter again have been divided into two sub-groups, anti-neuritic vitamine, fairly widely distributed in plants and necessary to prevent polyneuritis and beriberi, and the anti-scorbutic vitamine so necessary for prevention of diseases like scurvy. There have been suggested, therefore, the provisional names "fat-soluble A," "water-soluble B" for the anti-neuritic vitamine; and "water-soluble C" for the antiscorbutic vitamine. All three are

necessary in the diet for optimum growth and normal development of the young and for the maintenance of health and activity and ability to work in the adult.

It is of interest to relate the foregoing discussion to the Avocado and other fruits. Fruit has long been used as a food for man but it is only of recent years that the role of fruit in nutrition has been appreciated, and this is due entirely to the investigations above referred to.

The composition of fruits as determined by chemical analysis, indicating the percentage of the several nutrients, including *mineral matter*, has been well known for many years, but the character and importance of the latter were not until recently, properly recognized. The predominating ingredients of the ash or inorganic part of fruits are potash, soda, lime and magnesia. These are basic in character and tend to balance the chief ingredients of the cereals, meats, etc., which are of an acid nature, namely, phosphorous, sulphur, chlorine, etc.

How does the Avocado compare with other Fresh Fruits?

a. *Water.* The water content of pears, apricots and apples will average about 85 per cent; berries, 85-90 per cent; fresh prunes, 80 per cent; figs, 79 per cent; melons, 90-93 per cent; oranges, 85 per cent. The average for all fruits would therefore be about 82.5 per cent.

b. *Protein.* Apples and pears, 0.4-0.5 per cent; fresh prunes, 0.9; melons, 0.5; berries, 1-1.3 per cent; oranges, 0.8-1.0 per cent; grapes and bananas, 1.2-1.5. The average, therefore, for protein for the fresh fruits enumerated is practically 0.72 per cent.

c. *Mineral Matter.* Apples and pears, 0.3-0.4; grapes, 0.5; figs, 0.6; berries, 0.6; oranges, 0.5; melons, 0.5; fresh prunes, 0.6; bananas, 1.0. The average being 0.55 per cent.

The following tabular statement shows conclusively how much richer than other fruits is the avocado, in protein, mineral matter, and total solids; in other words, contains far less water.

	<i>Avocado</i>	<i>Other Fruits</i>
Water60-80	Average 70	82.50
Protein1.3-4.6	Average 2.50	0.72
Ash1.38-1.72	Average 1.50	0.51

In this connection it is also of interest to compare the avocado with some other foods. The avocado shows, on an average, about 70 percent of water; the potato, either raw or cooked, will vary from 75-78 per cent. The protein in the two foods is about the same, with the advantage on the side of the fruit.

Raw cereals yield from 10 to 12 per cent of protein; when cooked, however, will average about 2½ per cent: rice, less than 2 per cent. The mineral matter of the avocado will average at least 1.5 per cent; the corresponding figure for the potato is 1.0, either raw or cooked; cooked rice, 0.15; cooked cereals, 0.5; meat, 1.0; eggs, 1.0. It is thus seen that the avocado, when compared with cooked foods, which is the correct method of comparison, in view of the fact that we are discussing the material ready for consumption, is:

1. A richer source of mineral matter.

2. A richer source of protein than the potato, green vegetables, or the cooked cereals.

The main constituent of the foods mentioned is the carbohydrate, while the main ingredient of the avocado is the oil. The maximum percentage of carbohydrate in any of the foods in question, ready for consumption, does not exceed 20 per cent while the minimum percentage of oil noted for the avocado is 9 with a maximum of 32. As the caloric value of fat is $2\frac{1}{4}$ times that of the carbohydrates it is very obvious that the caloric value of a unit weight of the edible portion of the avocado is far greater than a corresponding weight of any of the foods above discussed.

This places the avocado, as previously stated, in a class by itself, and the only food that it can be compared with in this respect is the olive, but, as is well known, the olive requires processing before it is ready for consumption, which is not necessary in the case of the avocado.

In passing it may not be out of place to compare, as shown in the following table, the fat percentages of the edible portion of ten varieties of the avocado with ten varieties of the olive:

	Avocado, Edible Portion. Per cent.		Olive, Edible portion. Per cent.
Chappelow	29.10	Corregiolo	27.68
Blake	25.50	Nigerina	26.16
Puebla	26.68	Nevadillo Blanco	22.92
Sharpless	24.23	Mission	22.51
Northrup	25.30	Rubra	22.01
Lyon	26.89	Pendulina	21.36
Fuerte	29.93	Redding Picholine	20.83
Atlixico	28.50	Macrocarpa	20.41
Blakeman	21.55	Manzanillo	19.73
Miller	25.50	Columbella	19.54

The above figures indicate that the avocado ranks higher in fat oil than the average, or commonly used, olive.

Digestibility. Experiments carried on by the Nutrition Division of the University of California have clearly proven that the avocado is very easily digested by the human system and the digestion coefficient for the fat in this fruit was found to be practically equal to that of butter fat.

Caloric Value. The total food value is sometimes expressed in terms of calories per pound. This method gives us the value of a food for fuel purposes, so to speak. It is not always correct, however, to compare the food values on the basis of calories alone because the real value of a food to the body depends upon the purpose for which it is fed. For example, one pound of sugar contains 1820 calories; one pound of meat, less than 1000; yet one would hardly say that one pound of sugar is equal to a pound of meat when the question of growth is concerned. When, however, we are considering the question of energy alone, then the case is different. The following table shows the caloric value per pound and of the average helping for ten different varieties of the avocado:

Edible Portion

Variety	Weight Ounces	Calories per pound	Calories Average helping
Linda	20.4	659	418
Blakeman	13.9	1012	440
Taft	11.0	876	308
Sharpless	9.0	478	240
Puebla	4.4	1219	337
Spinks	12.2	884	334
Dickinson	6.8	736	312
Lyon	8.4	1228	306
Fuerte	10.6	1328	440
Snell	8.0	1430	308
Average			344

The corresponding figures for some fruits and other foods are indicated below:

Food Material	Calories Av. helping	Food Material	Calories per pound
Apple	72	Flour	1600
Banana	127	Bread	1200
Blackberries	60	Cereals	1600
Cantaloupe	93	Rice	1600
Grape fruit	139	Eggs, ed. por.	750
Grapes	112	Meat, lean	1000
Orange	100	Sugar	1820
Watermelon	39	Dried Fruits	1250
Butter	119	Potato	425
Cheese, Cheddar	100	Milk	320
Cream, average	60		
Milk, whole	160		
Eggs, boiled	90		
Beans, home baked	250		
Potatoes, boiled	145		
Bread, white	100		
Bread, Graham	100		
Macaroni, boiled	100		
Ice cream, cone	115		
Ice cream, dish	275		
Ice cream soda	avg. 300		
Ice cream sundaes	400		
Nuts, almond	100		
Peanuts	128		
Walnuts	125		

The above tables show conclusively the high nutritive value of the avocado, both as regards its total calories per pound and the calories per average helping. It should be stated that these latter figures refer to the avocado as such without the addition of any mayonnaise, French dressing, or other accessory. The addition of such to the fruit increases, proportionately, the caloric value.

Dietetic Value. The dietetical value of fruit, aside from the actual nutrients which it contains lies in its succulency, its mineral matter and organic acids. Very recent investigations by Osborne and Mendel have shown that fresh fruits contain appreciable quantities of the water-soluble vitamine. The fruits experimented with were orange and other citrus fruits, apples, pears, prunes, and grape fruit. It is to be hoped that in the very near future experiments may be conducted at the University which will show that the avocado is also rich in water-soluble vitamins. As Dr. Mendel states, the experiments with fruits placed the dietary value of these foods, hitherto recommended because of their salt content, their laxative properties, or their anti-scorbutic potency, in a new light as sources of water-soluble vitamine.

Judging from its composition, the avocado should perhaps prove to have laxative qualities of a peculiar or individual type, possessing as it does the combination of the usual "fruit principles," and that of fat or oil. The laxative properties of most fruits depend upon the stimulating effects of the fiber upon the wall of the intestine and partly upon the organic acids and minerals. Oil has a tendency to soothe and to lubricate the intestine even while it acts as a mild laxative. The avocado is a natural combination of these two types of foods—as if fruit and olive oil had been chemically combined by nature. Whether or not there is any special advantage in this natural combination over that made by a proper selection of foods remains to be proved. There are no clinical data on the subject, but future experimental work may give some interesting results.

The fact that the native Cubans prefer this fruit to any other of their abundant supply may be due to its flavor alone, but it is more than likely that the preference is more deep seated, and that it is the results of generations of experience or of a knowledge of its beneficial effects.

Nutritional Studies of the Avocado—1919-1921

M. E. JAFFA AND HAROLD GOSS

During the year 1919-1920 only 9 different varieties of the avocado, represented by 14 samples, were studied at the Nutrition Laboratory. It has been noted in previous reports that the oil percentage varied inversely with the size of the fruit. That statement is further emphasized by the results indicated in Table I.

TABLE I
ANALYSES OF AVOCADOS

Variety	Sample Submitted by	Locality	Date 1919	Weight, Grams	Physical Analysis Whole Fruit			Chemical Analysis		
					Seed, Per ct.	Skin, Per ct.	Flesh, Per ct.	Water, Per ct.	Fat, Per ct.	
Fuerte	I. J. Condit	Altadena	May 2	347	12.96	11.81	75.23	60.3	29.90	
Atlixco	J. T. Whedon	Yorba Linda	May 13	352	15.34	11.36	73.30	63.7	28.50	
Atlixco	J. T. Whedon	Yorba Linda	May 13	532	16.91	9.79	73.30	63.1	26.90	
Monroe	H. B. Sharpless	Santa Ana	May 14	595	24.20	13.61	62.19	75.9	6.97	
Mexican No. 2	A. R. Rideout	Whittier	May 16	628	12.42	12.10	75.48	76.8	14.60	
Mexican No. 2	Condit, I. J.	Sherman	Jun. 20	496	21.38	16.12	62.50	78.9	11.23	
Himebaugh	H. H. Himebaugh	San Diego	Jul. 18	451	17.95	14.62	67.43	78.2	9.90	
Himebaugh	H. H. Himebaugh	Sierra Madre	Nov. 17	313	18.20	14.05	67.75	55.9	32.40	
Himebaugh	H. H. Himebaugh	Sierra Madre	Nov. 17	300	14.66	12.00	73.34	54.5	32.90	
Himebaugh	H. H. Himebaugh	San Diego	Dec. 22	165	21.21	13.93	64.86	56.5	26.70	
Himebaugh	H. H. Himebaugh	San Diego	Dec. 22, 1920	256	10.18	9.66	80.16	50.6	23.20	
Himebaugh	H. H. Himebaugh	Anaheim	Feb. 27	357	19.88	14.06	66.06	74.8	16.20	
Himebaugh	H. H. Himebaugh	Anaheim	Feb. 27	383	20.10	9.90	70.00	80.0	13.30	
Himebaugh	H. H. Himebaugh	Whittier	Feb. 27	510	12.19	14.70	73.11	80.9	10.28	

ANALYSES OF AVOCADOS

TABLE II

Variety	Sample Submitted by	Locality	Date 1919	Weight, Grams	Physical Analysis <i>Whole Fruit</i>			Chemical Analysis	
					Seed, Per ct.	Skin, Per ct.	Flesh, Per ct.	Water, Per ct.	Fat, Per ct.
Seedling	H. C. Galloupe	Los Angeles	May 1	346	5.2	20.0	74.8	73.2	17.60
Victory (Seedling)	H. A. Phelps	Sherman	May 1	418	19.8	12.0	68.2	79.0	9.60
Victory (Seedling)	H. A. Phelps	Sherman	May 1	405	21.0	11.3	67.7	81.2	8.00
Queen	J. T. Whedon	Yorba Linda	July 8	745	13.6	12.0	74.4	79.0	13.40
Whittier	Chas. Hamburg	Whittier	Aug. 16	687	11.5	11.5	77.0	75.2	21.20
			1921						
Seedling No. 20	E. C. Dutton	Anaheim	Mar. 28	266	9.4	11.6	79.0	83.5	7.05
Colorado	R. Agnes McNally	Whittier	Mar. 23	461	10.0	7.0	83.0	72.5	16.83
Colorado	R. Agnes McNally	Whittier	Mar. 23	270	13.7	10.2	76.1	75.7	14.80
Fuerte	R. Agnes McNally	Whittier	Mar. 22	261	15.7	7.3	77.0	68.4	23.80
Stephens No. 15	R. Agnes McNally	Montebello	Mar. 31	428	16.6	14.3	70.1	77.0	13.66
Stephens No. 15	Wm. D. Stephens	Montebello	Apr. 18	311	16.3	15.3	68.4	73.1	17.57*
Stephens No. 15	Wm. D. Stephens	Montebello	Apr. 18	309	18.8	13.7	67.5	74.3	16.77**

*Protein 2.47 per cent.

**Protein 2.36 per cent

It will be observed from the table that a new variety of the avocado received from Sierra Madre, from Mr. A. F. Snell, weighing 313 grams, shows 32.4 per cent fat for the edible portion for the flesh. The corresponding figure for a second sample, weighing 300 grams, of the same variety being 32.9 per cent. This is the highest percentage of fat recorded by this Laboratory for any variety of avocado. The next highest 31.6 is credited to the Purdy grown at Whittier. The Fuerte, from Altadena, weighing 347 grams, or about three quarters of a pound, contains 29.9 per cent fat. Another variety, Atlixco, from Yorba Linda, weighing 352 grams yields a fat percentage on the edible portion of 28.5. Seven of the samples analyzed showed upwards of 23 per cent fat, the average for the total number being 20.21.

Table II presents the results of investigations carried on during the past year, which have been limited to the study of 12 samples representing 8 different varieties.

It will be noticed from the table that there are only two varieties showing above 20 per cent fat.

The samples as received at the laboratory would seem to indicate that the fruit is picked before maturity, the result being that the percentage of fat obtained by analyses is lower than that which the mature fruit would yield. This condition is well illustrated by the three analyses of Stephens No. 15, the first sample being received between two and three weeks earlier than the second and third. The percentage of fat in the last two is considerable higher than that noted for the former.

Unfortunately there appears to be a tendency upon the part of some shippers to endeavor to market their fruit as early in the season as possible so as to take advantage of the higher price. Such a practice is not conducive to the best interest of the avocado industry nor is it just to the consuming public in that the immature avocado is not only lower in fat than the mature but is also far less palatable. The result of marketing immature avocados will tend to discourage rather than to encourage the use of this valuable, highly nutritional fruit. At the same time it is not advisable to allow the fruit to remain on the tree until the maximum possible of fat is obtained because the percentage of fat will often increase for a period after maturity, the fruit in such cases becoming soft and more or less unpalatable.

THE EFFECT OF GIRDLING THE AVOCADO

J. ELIOT COIT

Certain varieties of otherwise excellent avocados are losing popularity on account of the habit of not coming into bearing as early and as promptly as is desirable for a commercial fruit. Various growers have attempted to overcome this difficulty by ringing or girdling. I have been asked to collect, digest, and present the results so far secured.

Scientific Consideration

In the first place, it is well for us to consider the girdled branch from the standpoint of plant physiology.

Dr. Jacques Loeb of the Rockefeller Institute for Medical Research in New York City, working on the general problem of regeneration of tissues in animals and plants, has brought to light new facts in regard to plant growth which have a wide practical application to the propagation, pruning and girdling of trees. To state the matter in a few words, Dr. Loeb has found out that every growing tip of twig or shoot is continually giving off a certain substance which, for lack of a better name, he calls an "inhibitor," which flows downward toward the root. This substance represses, slows up, or prevents the growth of buds on the main stem by which it passes. The path followed by this substance is the bark just outside of the cambium.

The dormant buds at the leaf bases situated some distance down the stem are prevented from all growing out as soon as they are formed by being continually repressed by this downward stream of inhibitors from the growing tips. If it were not for this, all the buds on a branch would immediately grow out, taking all the sap as it passed by them; there would be nothing left for the tips and growth in height could not occur. This discovery explains why tip buds which are farthest from the root grow the fastest. They are able to grow because they are at the apex, and there is nothing beyond them sending down an inhibiting substance.

As soon as we accustom ourselves to this new idea of a downward stream of growth inhibitors, we are in a position to understand why, when we girdle an avocado limb, the region immediately back of the girdle gives rise to several vigorous suckers. It is because the dormant buds near the cut are freed from the repressing effect of inhibitors, and inasmuch as the sap channels are large and abundant, the new shoots are extra vigorous. We can now better understand why, in top-budding avocado trees it is usually better to girdle the limbs above the buds than to cut them off entirely. The girdle relieves the bud from inhibitors and allows it to spring into normal growth; whereas if we cut the limb off entirely, the bud is sometimes drowned out by the excess of sap.

The effect of girdling a limb therefore is to permit the growth of suckers immediately behind the girdle which appropriate a part of the raw sap, thus checking the vigor of growth beyond the girdle. At the same time, the elaborated sap coming from the leaves, transported through the bark, is checked by the girdle and soon reaches a concentration which forces a rapid formation of blossoms and fruits.

Practical Results

Turning now from the field of plant physiology to actual results in the orchard, we find that girdling avocados does throw them into bearing. The testimony is unanimous on this point. I will have time to cite only a few of the large number of growers who have been good enough to answer my letters.

Mr. J. M. Elliott girdled a lot of Taft limbs in October. These limbs all bore from ten to twenty fruits each with nothing on the remainder of the tree. This year he has girdled a much larger number.

On October 24, 1918, Mr. Whedon girdled 65 Taft trees. The following summer he sold 234 fruits from the girdled trees, and none from those not girdled. It is interesting to note that even the next year the old girdles showed results, and in 1921 the Tafts bore 120 fruits while those not girdled are still bearing nothing.

Mr. Wm. Hertrich girdled 25 seedling trees with the result that 75 % of them blossomed and set fruit. At the ranch of Mr. Geo. D. Hoffman at El Mirador, Mr. Dolman has gotten good results from girdling and is continuing the work in an experimental way.

Dr. Keller girdled one branch of a three year old Linda with the result that the branch matured 38 fruits while only 2 were borne on the rest of the tree. Mr. Rideout and a number of others have had very similar results. Mr. Knight varies the process by using a binding wire instead of cutting out a girdle. His results show some variation depending on the time the wire was left on. Mr. Spinks uses the girdle extensively in propagating and top-working trees, but not for fruit production.

While practically every man who has girdled in October has gotten fruit, a good many seem to think the procedure is dangerous on the ground that the limbs may be weakened and break at the scar. No one cites instances of actual loss by breakage, and I am inclined to the opinion that this fear is not justified. Where the cut extends just through the bark and is quickly healed over, the branch should not be weakened to any extent.

Conclusions

Girdling is inexpensive and brings big results. It has not yet been shown to be attended with serious damage to the trees. The best time is October. The best width of girdle varies with varieties from $\frac{1}{8}$ to $\frac{1}{4}$ inch. Suckers arising behind the girdle should not be removed too soon.

By way of suggestion I would like to point out that more experiments should be made on root pruning. If a tree like the Taft persists in wasting its substance in riotous living and refuses to take life seriously, might not a vigorous root pruning furnish a sufficient check to vegetative growth to produce results without the scarring incident to girdling?

In closing I wish to thank the many avocado growers who, in response to my letters, went to such pains to write me of their results. To them belongs the credit of any value which may attach to this paper.

PROPER METHODS OF MARKETING THE AVOCADO

L. W. ALBRIGHT

The marketing of the California avocado is a problem of such great importance and magnitude that I hesitated very much before agreeing to speak on this subject.

At the May meeting of the Avocado Association last year a very able paper on this subject was presented by Mr. A. F. Yaggy. He handled the subject so thoroughly and in such an able manner that there is very little I can say at this time that was not brought out very forcibly by him and about the best I can do is to verify some of the important points which he brought out.

The past year has demonstrated very conclusively that a marketing organization for avocado fruits is absolutely necessary to the success of the industry, and had the association adopted some form of marketing before the present season started, the growers would have been much benefited in returns for this year's crop. Up to about the middle of February the large bulk of the crop was bringing the growers from 60 to 80 cents a pound, the average around 70 cents. About the middle of February fruit commenced coming on the market in great quantities and at much lower prices—around 40c per lb. The reason for this was twofold:

First, the large crop of fruit in sight to be marketed.

Second, lack of a guiding hand to direct the marketing.

Every grower seemed to be trying to get his fruit on the market ahead of his neighbor for fear that by the time he had a chance to market his fruit without making an extra effort to do so he would be able to get very little for it. I believe I am right when I say that over 50 per cent of the fruit which has been put on the Los Angeles market within the past 60 days could have been left on the trees to the advantage of the grower and the consumer. The grower would have received more for what fruits were marketed and the consumer would have received a better quality of fruits if the fruit had remained longer on the tree. Had there been an organization for marketing the fruit, it would have developed a market for this product in other parts of the country, thus taking a good deal of fruit from the local market, allowing it to bring the grower a much better price.

A year ago last April, having been closely associated with a dealer in avocados, we set about to find out what kind of a market there was for avocados in the middle western and eastern cities. The replies we received were not very encouraging, for they contained the information that the market at that time was taken care of by imported fruits at a considerably lower price than the California fruits were bringing in the local market, and that this condition would probably remain throughout the summer and early fall, so the matter was given no further attention by us. In the early part of January of this year we received inquiries from some of these markets for California avocados, but were given to understand that nothing but strictly first class fruits would be acceptable. We at once sent forward some Fuerte avocados, the only first class California fruit obtainable at that time, and we were unable to obtain more than a small quantity of them as the sizes they requested—from 14 to 18 ounces—were very scarce.

The first shipment proved to be very satisfactory to the eastern dealer and they urged us to ship a much larger quantity. In February we were able to get Lyons, Colorados and Spinks fruit. During the first part of March Dickey's were sent. The latter part of March more Spinks, some Challenge and Verde avocados were shipped. Fruit was secured from districts which are known to be in an advanced state of maturity and we were sure that they would give perfect satisfaction.

Up to the present time we have received nothing but praise for all the fruits that we have sent. The only objection was to the small amount shipped. This was the result of lack of time to devote to the shipping.

I have been asked to state what success was had with the different varieties as to shipping qualities. The Fuerte was good until the first of March. The Lyon, Challenge, Spinks, Colorado, Dickey have been continuously good. The Verde proved to be a poor shipper.

The container found to be the most satisfactory was the lug box holding two layers of fruit packed with excelsior below, between layers and on top; although some of the fruit which was packed in orange boxes arrived in good condition, others did not carry as well. None of the fruits were wrapped.

At this point I would like to read some of the comments that were received from eastern buyers. January 24, after receiving the first shipment of Fuerte fruit, they wrote as follows:

"This variety of fruit is an exceptionally good one and we can tell that the fruit is in its early stages and shall expect an improvement in size as the season goes on. It will be very important to receive only fruit whose cutting quality is first-class."

February 18 they state, "there is a ready sale here for your California avocados and they have given the best of satisfaction. Continue to ship fruit that will ripen promptly."

A letter received a few days ago states as follows: "Our experience with California avocados this season has been much more satisfactory than we had anticipated. It proved itself much finer than anything we had expected to see. In fact, this last shipment was a most agreeable surprise and makes our belief firm that California avocados will be sold on this market whenever prices will warrant bringing them here. We are at present receiving avocados from foreign ports, but your product is by far the best and commands a much better price. Apparently all varieties which you have shipped us have given perfect satisfaction. Still, the Fuerte, in our opinion, is the best early fruit and should be followed by Lyon, Challenge and Spinks as you have done this season. Our advice to the grower is simply to ask them to look upon avocados as a commercial proposition which must be brought to the attention of the public at popular prices in order to increase the consumption. The trouble with this business from what we have been made to understand has been that most growers when looking over their groves can see nothing but dollar bills hanging on the trees instead of fruit, and just as soon as they get this idea out of their minds and agree upon the fact that people have stopped squandering, many of them will find that this can be made a very profitable business for everyone concerned."

My experience for the past four months has firmly convinced me that there is a good market for California avocados in the middle and eastern cities at the rate of 700 to 1,000 fruits a week. Up to the present time the methods of marketing California fruits have been as follows:

First, selling by grower direct to the consumer, such as large hotels, cafes and clubs in Los Angeles.

Second, selling to a jobber, broker or retailer.

Third, shipping direct by grower to San Francisco and other outside points.

Fourth, selling fruit on the tree to a speculator or buyer.

These methods have served their purpose very well and the avocado grower has no reason to complain on the returns he has received for his product, but the time is fast approaching and in fact is already here, when these methods are insufficient to market the quantity of fruit produced and still bring the grower all that his fruit is worth.

The reason for the success of these methods in the past has been the demand keeping ahead of the supply, thus making it very easy for any grower to select one of these methods and obtain good results without interfering materially with the other methods.. In analyzing the methods, I wish to call your attention to some of the defects.

First, selling by grower to consumer, while it brings the grower the highest price he can obtain for his fruit, as it allows him to get the middleman's profit as well as his own, you must admit is not a fair proposition, for if you are to depend upon the middlemen to distribute your products, it is not right to be his competitor. If these methods continue, the jobber must have more of a chance to distribute the product if he is to remain in the business.

Second, selling to the jobber, or retailer, has as little against it as any of the methods, as long as the growers delivered their fruit in an even amount and did not crowd the market, allowing it to remain in a healthy condition, but this year's results verify the idea that there is still a much better way of disposing of the fruit. The same argument might be applied to shipping to any outside market. The grower is always in the dark as to how much fruit is going through that market and takes considerable risk by using these methods.

Selling the fruit on the trees, while it relieves the grower of considerable work and worry, allows the chance for big profits to be made by the speculator which should go into the pockets of the growers. Of course, there is more risk to the buyer in buying fruit in this way. Past experience has proven that it is far from being an ideal form of marketing.

After studying these methods from all angles and comparing them with results obtained by growers of other products who have used other methods, it is evident that there is a much better way of disposing of avocados. It is absolutely necessary to place the industry on a stable basis. It is time that the obsolete phrase in the by-laws of the association which state that one of its objects is the marketing of avocados should be brought out and made a living issue and I believe that this subject is the most important that can occupy the minds of the growers at this time.

The method which I would recommend to you is the co-operative form of marketing, because it is undoubtedly the method which will be adopted in the end if at first you do not do so. Again, it is a method which has been thoroughly tried and found most successful, especially by California growers of the citrus products. This organization has blazed the trail to success in the co-operative methods of marketing and is looked upon by everyone as being as nearly an ideal as any organization can be in that respect.

In collecting facts for this paper I obtained the views of sixteen of the largest growers of avocado fruits as to their idea of a marketing organization. Their replies, with one exception, were in favor of a marketing organization. Eleven were in favor of the co-operative plan, four did not commit themselves and one was against it. The argument advanced by the one who was not in favor of a marketing organization was that the condition of the industry at this time did not require it as was the case when the California Fruit Growers' Exchange was organized. The growers of citrus products were producing large quantities of citrus fruits and were getting nothing for it and the situation demanded a radical change.

Let us admit for argument that the situation at present is not to be compared with the situation facing the citrus growers, at the time their organization was formed, but their situation was the result of an evolution from the conditions which are similar to the avocado growers' now; that is, the demand was equal to the supply in the start but had gradually fallen behind. Also the methods of distribution had become inefficient. That is just the situation which the avocado growers should not allow to take place before they form an organization which they know will be of benefit to them for all future time. It will take at least one or two seasons of actual experience before the organization is in smooth running order. By that time it looks as if the situation will be such that the growers would rise en masse and demand that this method be adopted, if it is not started now.

It is unreasonable to expect all growers to look after the marketing of the product as well as the production of it. In fact, it is impossible for them to do so. Past experience has proven that.

Right here I would like to quote one of the arguments used by a grower who is in favor of the co-operative method. He says:

"No member can logically object, but should loyally support it, for one of the constitutional purposes of the California Avocado Association is the marketing of the avocado. Second, the grower of the fruit, especially the expensive avocado, cannot conveniently attend to the distribution any more than can the chef act as salesman in the dining room or engage in tray service. He must entrust even his finest creations into the hands of others for distribution, even though the usually nimble waiter should some time accidentally empty it down the front of some diaphanous gown or saturate a swallowtail. So any organization we can form may make mistakes, but in the main the service will be a boon to the comprehensive avocado grower."

The replies received from a number of the growers indicate they are under the impression that the facilities of the California Fruit Growers' Exchange could be used by the avocado growers for the distribution of their fruit, when eastern shipments become a necessity. I am unable to state how this opinion became so universal in the minds of the growers, but presume it was because so many citrus growers are also avocado growers and that their influence could be brought to bear to secure such an outlet for the avocado.

It is questionable whether the Exchange's facilities are best for the handling of avocados as their selling force has been trained to handle citrus fruits inclusive and are not familiar with the avocado. I understand the Avocado Association has made some effort along the line of affiliation with the California Fruit Growers' Exchange, but I believe there have been no results secured. The men who are prominent in the California Fruit Growers' Exchange are very willing

to be of service to the avocado growers in the formation and operation of a sales organization for avocados. If the Avocado Association should put the proposition before the California Fruit Growers' Exchange in a concrete form and should be unable to secure an affiliation with that organization, I am sure it would be wise for the avocado growers to form a co-operative organization of their own, and even if the avocado growers should secure such an affiliation, there would still be a necessity for them to have some organization of their own to work with the citrus organization.

The formation of a co-operative marketing organization for avocados should follow closely along the lines established by the California Fruit Growers' Exchange. Its members should be all growers who agree to market their fruit through the organization. They should elect a Board of Directors who in turn would select a manager and his assistants. Headquarters should be established at a suitable location in the terminal markets of Los Angeles where offices, sales rooms and packing rooms could be located.

The manager of this organization should call in what amounts and varieties of fruit he decides necessary for marketing from time to time pro rata from the different growers according to the amount of fruit they hold. He should distribute this fruit to the different markets throughout the country, collect moneys for the sale of the fruits, and turn such moneys over to the growers, deducting the necessary amount for the expenses of operating the organization. Some of this fruit could be ordered direct to buyers from the groves instead of being brought to Los Angeles, which a good many growers might wish to do. At the beginning of, and at intervals during each season a careful estimate should be made of the number of avocados of each variety available; the Association should adopt a label which should be placed on all boxes; a sticker showing the variety of fruit should be placed on all fruits so that people in using them would become acquainted with the different varieties and thus recognize the superiority of one variety over another after they had learned the difference; establish different grades of fruit; agree upon a container; decide whether selling fruit by weight or by dozen should prevail; establish selling arrangements in all the large cities with such reliable jobbers as are making the avocado a specialty, thus being able to keep in close touch with all the markets of the country and distribute the crop in a uniform and equitable manner, preventing certain markets being over-crowded and others under-supplied; conduct campaigns of advertising through the newspapers of the different cities; operate demonstration booths to better acquaint the people with the avocado as a food product, and many other details which it is not necessary to mention.

The cost of conducting such an organization is hard to determine. The highest cost would probably be the first two or three years and would gradually grow less as the amount of fruit marketed would develop. I believe an assessment of ten cents a pound upon all fruit handled by this organization in the beginning and which would grow less from year to year would fully cover the cost of this organization.

Whether you adopt this form of marketing or not, I strongly urge upon you to adopt at once some method by which you can prevent the glutting of the markets with fruit—especially immature fruit—and make it possible for one grower to obtain about the same returns for his fruit as his neighbor, as there have been a number of complaints made that there was too much difference between the returns to the different growers of fruit. The adoption of any form of marketing, I am sure, will be helpful to the growers.

In summing it up, the following benefits would be derived by a co-operative marketing organization:

Place the industry on an equal basis for all growers.

Control the output to conform with the demand.

Increase the demand to absorb the output.

Protect the grower and consumer by stabilizing the product.

Create confidence in financial circles as to the stability of the avocado industry.

Make every grower a helper to his fellow grower instead of a competitor.

Secure economy in buying supplies in large amounts for the growers.

Give the country at large a valuable food product at a fair return to the grower.

The avocado industry is prosperous. Keep it so. In time of prosperity prepare for adversity. Don't wait until it gets down then try to help it up. Keep it from going down. An ounce of prevention is worth a pound of cure.

LETTER FROM EQUADOR

WILSON POPENOE

Eighteen months ago I met with you at Santa Barbara, and immediately following that meeting I sailed for the tropics to continue the search for avocados which the Department of Agriculture commenced, at your instigation, some five years ago. This trip, however, as planned by my superiors at Washington, was to be somewhat broader in its scope than the earlier voyages: not only geographically, but also in regard to the plants studied. We have planned to cover all the interesting avocado territory between Guatemala and Chile; and it has been our intention not only to look for avocados, but to obtain for introduction into the United States many other plants as well. It has not seemed desirable to limit the present work solely to avocados, for the reason that we have already covered the best avocado territory, and are reduced to less promising fields. If we limited ourselves to avocados, and found nothing of value, the voyage would be unprofitable: but if we gather in as many promising plants of all sorts as we possibly can, the work may prove profitable even in those countries which yield nothing of value in so far as avocados are concerned.

Here I am, then, after eighteen months of this fascinating work, high in the Andes and precisely at the longitudinal center of the world; and from here I wish not only to send my cordial greetings to all of you, but also to give you a brief account of the work accomplished thus far.

My immediate destination, upon sailing from California early in November 1919, was Guatemala,—that country which seems destined to play a more prominent part than any other in the development of avocado culture in the United States. It was with a thrill of pleasure that I once again set foot on Guatemalan soil, after an absence of two years; and as I ascended into the highlands on board the little train from San Jose, and saw the glorious cone of the Volcan de Agua reveal itself among the clouds, I was fairly beside myself with delight. Some day, when all of you have made your fortune, as you of course will do if you grow avocados, I would recommend that you organize an excursion to Guatemala, for the members of the Association: not only will you see avocado regions which will have historic interest for us, but you will also see one of the most beautiful and picturesque countries of tropical America.

I remained in Guatemala nearly five months, but the last two were not very profitable: not only was I overtaken by a red-hot Central American revolution, but in addition I was confined to the hospital for nearly a month by an unfortunate accident to one of my feet. Of what value, may I ask, is an agricultural explorer without two feet?

We had not planned, on this trip, to do much in the way of searching for new varieties in Guatemala. I had come to this country primarily to obtain a large supply of pedigreed seed for use in connection with our experiments. At Antigua I obtained this, and landed it safely in Washington. There were seventeen lots in all, each representing a different avocado tree whose character and location were carefully recorded. The original collection of Guatemalan varieties, obtained in 1917 and 1918, is now being budded at Washington on these different stock-plants. It is our belief that ultimately we will find certain Guatemalan varieties to be more valuable for stocks than other varieties, and the work now being carried on is the first step in this direction. I hope that some day they will send me back to Guatemala to obtain a much more extensive collection of pedigreed seeds; or if they don't send me for this purpose, that they will send me for another. I hate to think of dying without seeing Guatemala once more!

While collecting these seeds in Antigua, I happened to find several choice varieties which were not encountered on the first trip. It was precisely the wrong season to cut and ship budwood (we have found, in Guatemala, that we can only obtain good results when we do this work in April, May and June); but I thought it worth an attempt, and sent buds of these varieties to Washington. I believe there were four in all, and one of them, No. 40 in my collection, is a most excellent fruit. Unfortunately, none of the budwood reached Washington in such condition that it could be saved. Perhaps we will have another chance to get these varieties: I hope so.

There are two very distinct phases of this work of avocado introduction: the first is to obtain varieties of good quality and good commercial characteristics, and the second is to see how they will behave in the United States. And I have become convinced that the explorer in the field must confine himself to the first phase, for he can form no accurate opinion respecting the second. My Nimlioh, obtained in Antigua during the earlier Guatemalan explorations, looked to me like a very weak grower, when I saw the parent tree, and I was not confident regarding its ability to make a strong, healthy budded tree in the United States. But I understand that it has shown itself, in Florida, to be one of the most vigorous of the entire Guatemalan collection. And Chisoy, which appeared to me in Guatemala to be a very strong tree, has proved to be so weak, when propagated by budding in the United States, that it will doubtless have to be discarded.

Therefore, I feel that the explorer should not attempt to judge a variety except upon its productiveness, the character of its fruit, and the ripening season: and in respect to the last named, I may say that he will find himself at sea in many instances, for in some parts of the tropics the seasons of the year are not well defined, and trees lose their normal periodicity.

From Guatemala I passed through Salvador, which did not appear to me to have anything of interest for us in so far as avocados are concerned, and went to Costa Rica, where I remained about three months. The cultivated avocados of this republic, practically all of them West Indians, are of little interest to Californians. I sent in several for trial in Florida, and I learn that two of

them were saved at Washington: these bear the numbers 42 and 45 in the series of varieties I have been obtaining in tropical America these last few years. They should, perhaps, be tested in California, for this work of Plant Introduction is full of surprises: but I do not recommend them to you for general planting nor even for extensive trial.

The incident of outstanding interest during the course of the explorations in Costa Rica was the discovery, by Oton Jimenez and myself, of a wild avocado on the slopes of the volcano Irazu. We found it in fruit, but not in flower: hence we have not yet been able to complete the botanical study of the species. But basing my opinion upon the character of the tree and its fruit, I am inclined to believe that we have at last fallen upon the true wild avocado, the prototype of the cultivated Guatemalan race and probably also of the West Indian.

The fruits of this wild avocado are the size of small oranges, quite round, and dark green in color, the general appearance being similar to that of many Guatemalan varieties. The shell is thick and hard, and the flesh, which is very scanty and of gritty texture, has a strong flavor of anise. We sent seeds of this species to Washington, and I am informed that about two dozen plants are now growing in the greenhouses there. While this fruit is of little value for eating, the plant will be tested as a stock for our better varieties. It is well-known that the wild forms of fruits which have under intensive cultivation reached a high state of perfection, often make admirable stock-plants, having more vigor than the cultivated varieties.

From Costa Rica I proceeded via Panama to Santa Marta, on the north coast of Colombia. This is a great avocado region, from which much fruit is exported to New York, and where, I am told, the avocado grows wild in the mountains. I expected to find the same wild form which I had just seen in Costa Rica, but I encountered, instead, a commonplace lot of West Indian seedlings which have become thoroughly naturalized in the mountains some 15 miles inland from the port of Santa Marta.

Among the varieties cultivated in this same region, I selected one for trial in Florida, and named it the Fernandez (No. 46). This avocado has been successfully established at Washington.

In general, the avocados of Santa Marta, referring only to the cultivated trees, are a rather superior lot of West Indians. Since, however, we are not at present devoting much attention to this race,—practically none at all in California,—and since the season was nearly past when I reached Santa Marta, I did not long remain there. An early-ripening West Indian would be of value in Florida, but I was not in Santa Marta at the right time of year to search for such a variety.

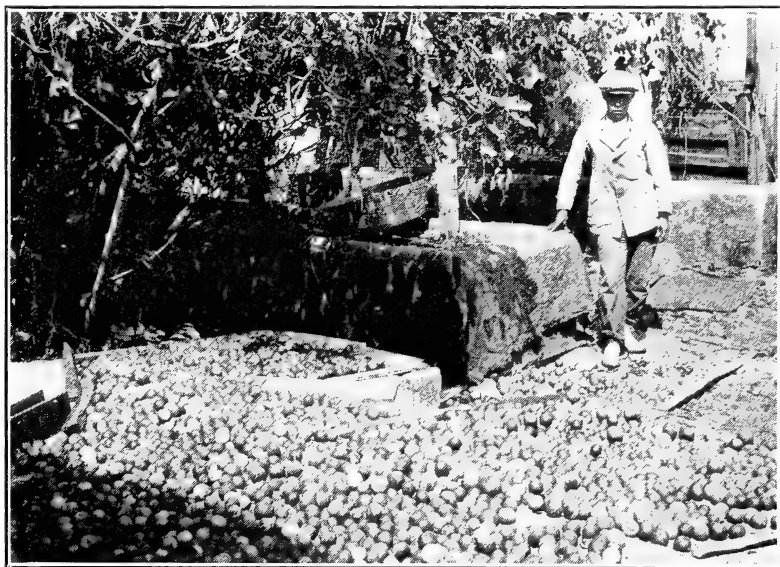
I next proceeded to Bogota, the capital of Colombia, where I made my headquarters from August to November, while collecting in the eastern Andes. The avocados of this region proved to be inferior West Indians, and I made no effort to introduce any of them. The same was true of the varieties found in the Cauca valley of western Colombia, through which I passed on my way to the Pacific port of Buenaventura, whence I sailed southward to Guayaquil.

On this trip down the coast I was fortunate in being taken on board an American tramp steamer, owned by the Shipping Board. She was not allowed to carry passengers, but the captain signed me on the ship's articles as Assistant Purser. The boat had just come from New York, and everything which came out of the galley had an unmistakable American flavor. I had been living on



—Photo by Wilson Popenoe

Market scene at Coban, Northern Guatemala. It is to such markets in the tropical cities that the natives bring their wares, including fruits, for sale. This is one of many visited by Wilson Popenoe, in his exploration work to secure new and finer varieties of avocados and other plants and trees. Occasionally a superior fruit will be found on sale in such a market. It is then traced back to its place of growth, and the tree on which it was grown is carefully studied.



—Photo by Wilson Popenoe

Part of a lot of 10,000 avocados, gathered in the highlands of Guatemala by Wilson Popenoe, explorer for the U. S. Department of Agriculture. They are being dried at Guatemala City, preparatory to the extraction of the seeds, which are to be sent to Washington. There they will be grown in the Department greenhouses, to be used as stocks for the buds which are being sent up by Mr. Popenoe from time to time, as valuable varieties are discovered.



poor rations while crossing the Andes of western Colombia, and if you could have seen the way I waded into the pork and beans, or the facility with which I dispatched the doughnuts and apple pie, you would have been surprised if not shocked. The officers were complaining of the food, but no one heard a whimper from me.

I have made no mention of the miscellaneous plants which I collected in the countries referred to above; the beautiful dwarf palm of northern Guatemala, of which I sent a thousand plants to Washington; the giant blackberry of Colombia, whose fruits are two and a half inches long by an inch and a half in thickness; and many other things which will be of interest to Californians. In order to keep this report within reasonable limits as regards length, I will confine myself to avocados: but I wish to call your attention to these other plants, because it would be difficult to explain, otherwise, my relatively long sojourn in certain regions, such as the highlands of Colombia, where there are no avocados of interest.

I was put ashore in Guayaquil, and the day before Christmas I reached Quito, where I have since made my headquarters, and which I shall continue to use as a base until June or July. For I am finding Ecuador one of the most interesting fields I have ever worked, from the standpoint of general collecting; and just recently I have stumbled upon a nest of remarkable avocados which I think are worth our attention. The highlands of this country are full of small-fruited Mexicans, this race doubtless having been introduced here at an early day. On the coast there is the usual complement of indifferent West Indians, with a few good sorts among them.

Three weeks ago I loaded my blankets, collecting kit, and a few tins of California fruit on a pack mule, and climbed into my saddle for a trip northward to the Colombian frontier. I had no idea what I was going to find, nor exactly where I would go. The first day we rode to a ranch called La Providencia, and there we stopped over night: at least, we stopped part of the night, for at two o'clock we were up, and by three we had the animals ready for the trail. It was pitch dark, but my mule-driver knew the trail as well as I know the road to the Altadena postoffice, and we struck out for Ibarra. We rode nearly sixteen hours, and made the town after dusk. Here, after the customary argument with the hotel keeper in regard to rates, I obtained a dirty room with a bed so hard that pine boards would have been soft in comparison. And the fleas! They swarmed upon me, and greedily devoured the flea-powder which I fed them.

I arose in the morning feeling stiff and lame, but all this was forgotten when I found in the market-place an avocado which appeared to be a Mexican, yet was of remarkably large size for that race, and altogether an excellent fruit. I asked whence it came, and was told that it had been grown at San Vicente, in the valley of the Rio Chota, about five hours' ride from Ibarra.

So I prepared immediately to visit San Vicente, to see the numerous avocado trees I was told were to be found there. But suddenly, as I was walking through the street, I was hailed by an officer of the law, and hustled off unceremoniously to the police station. The Chief abruptly asked me where I came from, why I came from there, and what I thought I was going to do in Ibarra. I enlightened him on all these points. He then asked for my passports. They were in the hotel, so I offered to send them over to him. He said this would be satis-

factory, so, accompanied by the gallant Lieutenant Ortiz, I went to the hotel and turned over my precious documents. I was informed that I could have them back at three o'clock. It takes a long time to examine a passport in Latin America,—it was then about nine in the morning.

That afternoon at the specified hour I presented myself at the Chief's desk and asked if I might be permitted to receive my passports. "No," said he, "you are under arrest. I have learned certain things about your past, and have telegraphed Quito that you have been captured, and I am awaiting instructions."

Ladies and gentlemen of the California Avocado Association, I ask you was this not a bit disconcerting, just when I was on the eve of locating a valuable avocado?

The Chief would not tell me just what he knew about my past. I tried to recall something that I had done, something very wicked and horrible which would justify these proceedings, but I could not; so I simply telegraphed our Minister in Quito that I was held on suspicion, and begged him to aid me if he could. That night at about ten o'clock I received an answer which said:

"Your telegram received and matter presented to Minister of the Interior tonight."

With this in my possession, I slept peacefully, and when, in the morning, I presented myself to the Chief the matter was quickly cleared up: it appeared that they were on the lookout for a German who had stolen some money from Bogota and had started for Ecuador; and since my passport bore the vise of the Ecuadorian Legation in that city, and since it was evident I was a foreigner (the Chief did not distinguish between the different brands: Germans and Americans were one to him) he immediately jumped at the conclusion that he had made a big catch. No doubt he already had visions of a congratulatory telegram from his superiors in Quito, when my message from the American minister arrived to dispel them.

So we started for the North. In Ibarra I had made the acquaintance of a splendid young fellow, Jose Felix Tamayo, and he offered to take me to his hacienda, which was not far from San Vicente. I went very gladly: but while I was up at his place it began to rain, and the roads, I well knew, would soon be in terrible shape. So I started down to San Vicente, and found it already bad going. My horse fell beneath me, and I thought it safer to get off and walk. After an hour of nasty work, I came to a ranch house. Here I stopped to inquire the distance to San Vicente, and to ask if the road in that direction was as bad as the one over which I had just come. The man laughed. "Caramba!" he said, "that road you have been traveling is a good one. Wait until you see the gullies and mud-holes ahead." Encouraging, wasn't it? But fortunately, the man had lied. The road was not bad, and I reached San Vicente at sundown.

Here I found plenty of avocados: a few of them West Indians, many Mexicans, and two or three which looked like hybrids between the two races. I spent two days examining the trees, and finally picked out five varieties which looked promising. After cutting budwood of these, I started for Ibarra, and at a small town on the road I sent a telegram to Quito asking when the next mail would leave for the States.

Upon reaching Ibarra I found a reply to this telegram, advising me that the mail would leave on Sunday afternoon. It was then Friday evening. I was frantic. With good animals, and by riding steadily, I could not reach Quito in less than 20 hours, and I had yet to find the animals. In vain did I search

for them. Finally I had to give up hope of catching the mail. It meant, very likely, the loss of all my budwood,—for there would not be another mail in less than ten days,—and in this case I would have to make a second trip to San Vicente, better timed to catch an outgoing mail.

I came slowly back to Quito, and upon arrival found that the next mail would not leave for nearly two weeks. The budwood is packed, and lies here in my room as I write these lines. I do not have much hope of its reaching Washington alive, but I shall send it; and then I shall go back to the valley of the Chota and cut more, and if this does not go through in better shape, I shall repeat the procedure; and I shall fight it out on these lines if it takes all summer!

Ladies and gentlemen of the California Avocado Association, this business of hunting avocados is hard work. I do not say this boastfully, nor in a spirit of complaint, nor even to elicit your sympathy: Andean fleas are not afraid of sympathy, nor is Andean mud made more pleasant thereby. I feel—and I hope I am not mistaken,—that this is a work which is worth while, and in doing it I believe I have your moral support. And after all, it is not only a privilege, but a pleasure, to serve the people of our United States of America!

Quito, Ecuador,

WILSON POPENOE.

March 1, 1921.

NOTES ON THE PLANTING AND CULTURE OF AVOCADO TREES

BY T. U. BARBER, WM. HERTRICH, CARTER BARRETT, S. W. JAMIESON

I. THE GROWING OF NURSERY STOCK T. U. BARBER

Selection of Seed.

The thin skinned Mexican fruits contain the most desirable seed from which to produce root stock and are generally used in California. This type is more resistant to both frost and heat, produces an extremely vigorous root system and has the strongest class of wood to be found in the different types of avocado trees. Seed should be obtained from strong, healthy trees producing fair sized seed.

Planting.

The thin skinned Mexican fruits mature during the fall months, therefore it is best to plant the seed in special beds which can be protected with glass or canvas covers during the cold winter nights and heavy rain storms. The most satisfactory soil for the seed bed is a mixture of half sand and half leafmold or rich loam soil. Plant the seed two inches apart, with the pointed end up, cover the tops with a light, clean sand to keep the bed from baking.

Irrigating Seedbed.

The seed should be kept moist but will not require heavy watering until the warm days of spring, when the small seedlings are well leafed out. Seeds planted during October, November and December should be three to six inches high in April or May, when they are ready to transplant.

Transplanting Seedlings.

It is best to transplant the seedlings from the seed bed to the nursery rows before they grow too large and have developed a heavy root system. Plants up to six inches can be handled with bare root without much setback. They should be carefully shaken out of the seedbed soil, cutting off all injured roots, and placed at once in small boxes which will hold about fifty packed with wet moss around each one and the box covered over with wet burlap. Take the trees out in small lots so that each tree is planted in the nursery within one hour from the time it is removed from the seed bed.

The nursery soil should be moist and easily workable so the roots may be spread out in the trench, made by a small walking plow, and loose soft dirt carefully rolled in around them. Water must follow the planting within a few minutes to settle the soil and freshen the small trees.

Irrigating Nursery.

Water should be supplied very close to the newly planted trees every few days until they are well established.

Shades.

Each tree must be shaded from the direct sun, shingles being generally used for this work.

Do not use pots or boxes in raising avocado trees. They produce root curl and spoil the future growth of the orchard trees.

Budding.

Stock planted in the field during April should be ready to bud the following August or September. The seedlings should be from three-eighths to three quarters of an inch in diameter before budding.

Budwood of the different varieties is not alike. In some kinds a bud which is slightly broken open can be used, while in others this advanced bud is sure to be unsuccessful; therefore it is necessary to become familiar with the wood to be used and learn which buds grow best in each variety. In general, it is desirable to select a plump, mature bud which seems ready to start into growth. Early in the spring this wood is obtained from the last growth of the previous year, and later in the season from the new branches. This new growth must become fairly mature, which usually requires six to ten weeks. Very little success is obtained from using soft tips.

Cut a shield bud three-quarters of an inch or more in length allowing an equal amount of wood above and below the bud. Do not remove the hard wood from the shield. It is best to leave a short piece of the leaf stem to push on while inserting the buds, this also protects the bud from the wrapping. The common T shaped cut is made, being careful not to break the bark in placing the bud. The sap must be flowing freely so that the bark separates readily.

Waxed tape or heavy soft cotton string is used for wrapping with equal success. The bud must be tied extremely tight as close to the eye as possible without covering it. Secure the wrap by slipping the end under the last loop and pulling down tight. Many buds are lost through spreading of the bark. Unless the wrap seriously cuts the bark do not remove it for at least four weeks. If the stock is growing very fast the trees should be gone over very often, starting the end of the second week and re-tie any that show a serious cutting by the wrap.

The seedling tops are cut back gradually to start the bud into growth, always allowing a few leaves to remain to aid in keeping up the flow of sap above the bud. The avocado will not stand the complete topping, so often practiced in citrus work. The bud should be at least six inches high and contain some mature wood before the entire stubbing can be made. This is most satisfactory if practiced through the cool months of spring.

After the bud is started, it should be tied with raffia every few weeks in order to make a straight trunk. The seedling top can be used to good advantage in this work until the bud is large enough to require staking.

The suckers and heavy branches should be kept off until the tree reaches a height of 24 to 30 inches, when it will generally form a perfect head of four or more branches. Stock grown in this manner soon shades itself and makes a beautiful, well shaped tree.

The only way to carefully transplant budded avocado nursery stock is by balling. Careful handling of the balls, hardening off in a lath house and great care in shipping are extremely important to obtain the best results.

2. TOP WORKING BY BUDDING

T. U. BARBER

In budding over old or large trees the first operation is to cut back the trees half to two thirds, leaving several large limbs and some foliage. It is best to place the buds in the main trunk wherever possible, allowing the new head to be formed from one bud, thus making it possible to form a more perfect structure from a mechanical standpoint. It is well to place two or three buds in a ring around the trunk to be bound in by the same cord. After these have grown the most suitable one may be selected for the new head.

Budwood sticks for topworking large trees should be of large caliper and the eyes plump, large and well formed. Cut the buds longer and with more hard wood than in those generally used in nursery work. The top of the bud shield should be cut off square and fitted closely to the cross cut on the incision. For wrapping sixteen ply white cotton string should be used, being careful to pull it absolutely tight, completely covering the incision and wrapping very close to the bud without covering it. Too great care can not be used in wrapping, as this is one of the most important features of top budding.

Never remove the strings until they show serious cutting of the bark; leave them on for at least two months or more if possible as seventy-five per cent of the buds placed in heavy bark are lost through spreading after premature removal of the wrap.

After the buds have been in from four to six weeks sucker growth should be removed to force the bud growth. It will be necessary to tie up the new buds in a careful way as they make a very soft, vigorous growth.

The old trunk and heavy limbs must be protected from sunburn by either a loose wrapping of burlap or heavy whitewashing, burlap being the most practical.

Pruning in order to shape and stock up the bud and relieve it of overweight to prevent breakage is necessary.

The complete stubbing off should be left until the following year, when the bud contains a considerable amount of hard wood.

Trees being top worked must be kept in the most vigorous condition to insure the success of the work.

Where the buds have failed to take and the tree has been severely cut back and kept so during an entire season it will be necessary to allow the tree to fully recover before being budded again or the life of such tree will be seriously endangered.

3. TRANSPLANTING YOUNG AVOCADO TREES FROM THE NURSERY INTO THE ORCHARD OR BACK YARDS

WM. HERTRICH

By far the best time to transplant young avocado trees from the nursery is in the Spring, as soon as the ground is warm enough to encourage root action, regardless of whether the stock has been previously established in cans, boxes or taken from the nursery row. Established plants, which have been kept in the open for some time before planting, will require no special protection, but plants taken from a lath-house or other shaded places ought to be protected for the first few months from the strong rays of the sun; if no shade is provided and a few warm days should follow the planting, the tender foliage as well as some of the soft shoots will become sunburned and cause a severe check to the young tree in establishing itself in its new place.

The holes for the trees should be dug large enough to provide plenty of loose soil for the young roots for the first couple of years. In ordinary soil a hole three feet square by three feet deep should be ample; if any layers of hard-pan are present within this distance or below the three foot level they should be broken up, which can be done easily by the use of powder.

When planting the trees the holes should be back-filled from the surrounding rich top soil, if such is present; the poorer soil from the bottom of the hole can be utilized in making the rim of the basin. If a hole three feet deep is used, the required back-fill should be firmed down well, otherwise the settling of the ground would result in having the tree too low and in most cases out of plumb.

The string with which the sack is held above the ball should be cut and the flaps of the sack laid down so that they will decay in a short time. Immediately after planting, a good irrigation is necessary. At all times be positive that the ball of the tree, before it is placed in the hole, is not in a dry condition, especially so, when the earth of the same is of a heavy clay soil, which gets hard when dry and does not take in water as freely as it should.

In light open soil with plenty of drainage there is no danger of over-watering young trees, but in heavy clay or when hard-pan is present it is necessary to be cautious as over irrigating would cause sour soil, which would prevent the young roots from establishing themselves, as well as be injurious to the old roots, causing a sickly yellow looking tree which in the end would probably die.

In making basins for irrigating, it is a mistake to form the funnel or crater-like affair with its deepest point around the trunk of the tree. It is far better to make a circular ditch around the tree, leaving six inches of high ground next to the trunk. All basins should have some kind of a mulch covering to keep the moisture from evaporating as well as to keep the soil from baking hard.

All young trees should have a stick for the first couple of years placed to the south or south-west side to act as part shade for the trunk. A lean-to shade made out of burlap about 5 feet square and fastened to 5 or 6 foot stakes can be used as means of shade for the first few months after planting.

4. IRRIGATION

S. W. JAMIESON AND WM. HERTRICH

The irrigation of the Avocado, like every other subject in connection therewith, occasions wide diversity of opinion. The planter must study his soil and other conditions, and adopt a system that will meet his requirements and limitations. At one time it was considered impossible to over-irrigate, but it has been found that too much water is as bad as too little, and for this reason the drop system has been practically discarded.

There are three systems of irrigation in general use; furrow, basin, and overhead. In the first, furrows are made between the tree rows, usually with a team and cultivator; water is then turned into the furrows or rills, cutting down the flow when it has reached the end of the furrow and allowing it to run until sufficient water has been applied. The drawback to this system is that it requires the use of a horse or team at exactly the right time, which is not always possible on a place not large enough to warrant owning such equipment.

To use this system of irrigation it is very important to have the distance of the pipe lines correctly spaced. In light open sandy or gravelly soil the irrigating lines ought not to be more than two hundred feet apart; if the soil is of the light silty type the distance can be increased to about three hundred and fifty feet, while in heavy soil as much as four hundred and fifty feet between irrigating lines has been found to be satisfactory.

The length of time the water should run in the furrows is governed by the type of soil as well as the lay of the land. In a light open soil, with a one to two per cent grade, less time is necessary to accomplish the required results than would be in a heavy soil under the same grade conditions. However, to keep the water in the furrows from twelve to forty-eight hours, according to the conditions, should give satisfactory results.

The basin system consists in making a more or less permanent basin around each tree, which is filled with water at stated intervals. This basin is sometimes cultivated and sometimes kept filled with a mulch. Opponents of this system claim that it brings all the roots to the surface with ultimate injury to the trees.

The overhead system involves the piping of the entire orchard with water under pressure, together with sprinklers, either portable or permanently placed. The largest type of these sprinklers consists of an upright pipe of any height up to sixteen feet, with a revolving cross arm at the top, each end of which has a nozzle. It can be arranged that one end throws the water in a wider circle than the other, thus giving an even distribution over a circle of about sixty feet diameter. Where tall uprights are used as portables, they must be guyed to the four corners of a wooden platform. If sufficient sprinklers are used, the entire orchard can be irrigated at once, which would be of benefit in case of frost or excessive heat. The washing the trees receive, has some value in removing dust

and keeping down pests. This system requires less labor than any other but is quite expensive to install; portable standards sixteen feet high cost about sixteen dollars each in addition to the cost of piping the orchard and the necessary hose connections.

In any system, the proper amount of water for the best results is dependent upon several conditions, one of which is the geographical location. Certain parts of San Diego, Orange, Los Angeles, Ventura and Santa Barbara Counties bordering on the shores of the ocean obtain a great deal of moisture from the heavy fogs; furthermore, the average temperature in these sections is considerably lower than in some of the interior valleys, such as San Bernardino and Riverside Counties. Using the same method of cultivation for both the interior and coast regions, it is natural that less actual irrigation is required along the coast than further inland.

The second, and perhaps the most important factor to be taken into consideration, is the local condition; as to the lay of the land, and as to the texture of the soil; whether heavy, medium or sandy. An orchard with the soil in good physical condition and correctly cultivated can be properly maintained with much less water than would be required in the same orchard when cultivated poorly or not at all. Poor physical condition of the soil can be improved a great deal by planting a good cover crop to be turned under, or by applying stable manure or other fertilizer containing a large amount of humus. Sometimes a heavy soil requires but one of these methods whereas a light sandy soil may require both cover crop and manure.

Taking into consideration the geographical location, local conditions and physical properties of the soil, as well as weather conditions, the irrigations during the season should be three to five weeks apart. In the more exposed sections, the young growth may be seriously damaged by early frost, if the trees are over irrigated in the fall months.

Deep cultivation is the best means of preserving the moisture in the ground between irrigations. Cultivate as soon after irrigating as possible, before the soil gets too hard; repeat if possible once more before the next irrigation, discing or cultivating to a depth of six inches.

For the back yard trees it is practical to make a large basin, leaving twelve to eighteen inches of soil around the base of the trunk to prevent the collection of most of the water at this place. The ditch should be about four feet wide all the way around the tree with a six inch excavation, placing the soil around the outside of the basin so as to increase its capacity. The deepest part of the basin should be around the outside in order to spread the seepage out as far as possible, as the roots have a tendency to follow the moisture. The excavated portion of the basin should be filled with strawy manure; all kinds of old leaves can be used as well as peat or any other compost material which does not get hard after the water recedes. During the irrigating season the basin should be filled about every two weeks; however, if hardpan is present as a subsoil, care must be taken not to over water, as sour soil will be the result. On the other hand, light sandy or gravel soil cannot be over watered, unless underlaid by a heavier soil such as clay or hardpan. It is advisable for any grower to have a soil auger by means of which the moisture contents of the soil can be learned and the necessity for application of water be gauged.

5. CULTIVATION

WM. HERTRICH

It is a well known fact that the Avocado tree is inclined to make a great number of surface or near surface roots, if permitted to do so, which is against proper methods of establishing an orchard of any kind in a country where summer irrigation has to be applied as the only source of moisture available. Intelligent tilling of the soil will avert the condition mentioned above and will encourage the roots to seek deeper levels, which is manifold in its benefits.

First, a four to six inch mulch can be maintained which aids to hold the moisture and permits air to work into the soil, both of which are very essential. Second, the root system, which is forced to seek lower levels, is better for anchoring a tree and holding it in an upright position. Third, in case the main supply of water, for some reason or other, breaks down in mid-summer, just at the time when your turn for irrigation comes; if your soil is in good physical condition, with a six inch mulch on top, your trees will withstand the water shortage much better than a non-cultivated orchard with most of its fibrous feeding roots near the surface.

Two methods of tilling the soil are practiced, one of which is plowing and cultivating, and the other is just cultivating mostly by means of discing. Either of these methods is satisfactory, if intelligently done, but the first is preferable to the second. Plowing ought to be done about once a year with either a disc or mold-board plow not less than eight inches deep and should be followed immediately with a disc or tooth harrow as required by prevailing conditions. If cover crop has been plowed in, discing will have to follow plowing, but in case of no cover crop either one of the tools mentioned will do satisfactory work.

The proper time to plow an Avocado orchard is a hard question to decide as not enough experiments have been made along this line to form definite conclusions. If no cover crop has been planted and deep cultivation has been practised it won't matter materially whether the plowing is done in the winter or early spring months as only a small percentage of the roots will be cut; on the other hand, it takes six months to mature a cover crop, during which time no cultivation has been done and perhaps a little more water has been applied with the result that a large number of feeding roots have crept near the surface. All of these accumulated feeders, as well as a few more below will be cut during plowing, consequently it is not advisable to perform this work during blooming time as a certain amount of check will follow and very likely would affect the setting of the fruit. This method, however, is only practical when the orchard is planted with one or a few varieties which bloom at the same time, but as the blooming season of the various Avocados ranges from early fall to late spring it is very difficult to specify the proper time to do the work, especially so when several varieties are interset, which method of planting is frequently practised.

In heavy or near heavy soil plowing or discing practised for some time often causes a hard crust below the depth or reach of the tool used. This formation called plow sole finally gets hard enough to resist water penetration; to avoid this condition, plowing two different depths at different times is advisable, also, use of subsoil plow once or twice through the center of the rows both lengthwise and crosswise from twelve to sixteen inches deep according to the requirements, but not when the trees are in full bloom. If subsoiling is practised during the summer months it should be followed immediately by irrigation. Cultivating and irrigating should be used in conjunction and must be practised

intelligently; to cultivate too soon after irrigating is detrimental to the soil, especially so when of the heavy type, as the soil does not pulverize well and stays too open, consequently the moisture evaporates too freely; to wait too long with the cultivating after irrigating is just as bad, if not worse, as the soil will not break up and make a fine mulch but will remain in a dry and baked condition. But generally speaking from three to five days should elapse between irrigating and cultivating, depending upon type of soil and other conditions.

The non-cultivation of the Avocado orchard is not to be recommended, as the root system of the trees will be formed too near the surface and the crop of weeds, which will grow as the result of irrigating and no cultivating, will take away a great deal of moisture from the tree. On the other hand, if the weeds are plowed under once a year, it will add to the physical condition of the soil.

When trees come into bearing, fertilizer applied to the best advantage should be plowed under in case of barn-yard manure and if of the commercial type should be either plowed or drilled in.

To sum it up—intelligent plowing and cultivating at the proper time is advisable in preference to no cultivation.

6. FERTILIZATION

WM. HERTRICH

It is the general opinion of most Avocado growers that a liberal application of fertilizer of some kind or other is necessary, when trees begin to bear heavy crops. To this date barn-yard manure has been used in most cases, but experiments are in progress as to the value of commercial fertilizer; tankage, bone meal and fish meal having been used, the results of which should be available within the next year or so.

Different kinds of cover crops have been used (in some of the larger orchards) of the leguminous types, which improve the physical condition of the soil as well as add humus and nitrogen. The most common legumes in use at the present time are the *Melilotus indica* and Purple Vetch.

The Avocado tree is very similar to the citrus tree so far as its growth is concerned, the fruit, however, differs considerably in its analysis, and bearing trees will probably require somewhat different proportion of fertilizing elements to produce satisfactory results.

7. AVOCADO PRUNING

CARTER BARRETT

The pruning of any tree is prolific of more argument than any other phase of horticulture, perhaps, and the avocado is no exception to the rule. Many growers have left their trees severely alone in this regard, arguing that the avocado is naturally a drooping type of tree, and should be allowed to spread all over the ground. Very few deny that this has been a mistake, now that the young orchards are reaching the bearing point.

Based on an experience covering large acreages, and consisting of many varieties, in different localities and ranging over a period of years, the writer has developed certain well defined general methods, which, of course, have varied in details to meet the individual problem of each tree. A budded avocado, being an artificially produced tree, must receive help outside the ordinary course of nature in order to form the sturdy framework requisite to the successful carrying of the heavy loads of fruit the grower expects of it.

The pruning of the avocado may be divided into two phases, the first consists of the formation of the tree during the first three or four years or up to the time it begins bearing; the second consists of the treatment bearing trees should have.

Due to the extreme brittleness of avocado wood and the tendency of the trees to form dangerous types of crotches, the wisest and most successful type of structural framework to build up is based on a modified leader plan. In other words, the main limbs should radiate from the central trunk up to a height at which it seems desirable to stop direct upward growth, which will vary with type and variety of tree. In order to achieve this result, it will be necessary to carefully stake all young trees as they are set out and to follow this staking up consistently until the tree is at least twelve or fourteen feet in height. The best way to do this is to use one stake placed immediately against the trunk of the tree and up which the trunk should be carefully trained. This stake should be placed against the wind. After the first year, two by two redwood in eight foot lengths will be found best for the purpose. If these are creosoted they will last indefinitely. If necessary, one by two pine can be spliced with baling wire to lengthen these. In young trees, a judicious amount of heading of the limbs will be necessary in most cases, in order to stock up the trunk and primary branches, and to correct a too droopy tendency. No limbs should be allowed to attain any permanent size or maturity closer to the ground than two and a half feet. If any one limb seems determined to take the growth of the tree, the only safe thing for the future of the tree is to remove it entirely. Sunburn and water starvation must be zealously avoided as they will defeat all the skill of the most experienced pruner.

In the first few months after setting the young tree out when the growths it makes during the re-establishment periods are very short, as little cutting should be done as is consistent with the correction of structural faults carried over from the nursery.

If, during the first months, the tree makes little growth, the bark of the trunk may become tight and constricted, preventing proper development when the tree does become established, it is advisable to slit this bark lengthwise, giving the trunk a chance to expand. This will heal very rapidly and aid the tree greatly.

It is vitally important in handling young budded avocado trees that no stubs be left and all cuts be carefully painted. A cut should be made either close to a bud or flush with a small twig. Any ragged cuts should be carefully trimmed with a knife. A saw cut of any size should always be trimmed with a knife on an avocado of any size. The danger of die-back in young trees establishing themselves, when these details are not properly observed, is much greater. If it is necessary to cut the terminal of the leader of a young tree, great care should be exercised. If cut to a plump bud in the internode, the result will be that the growth will be temporarily checked, stocking up the tree, but allowing the leader to eventually continue upward. If cut to a small twig, limb or bud of poor development, the result will be that the tree is more or less permanently flattened out at this point. Further upward growth will follow several leaders in this case. The split-type of crotches should be removed as fast as they appear, as they are a great menace.

Now as to the second phase or the treatment of trees from the time they begin production onwards. If the methods outlined above are carefully followed, there will be no necessity for any severe cutting (particularly stubbing or heading

of limbs) in the matured or maturing trees. This is a very desirable state of affairs, as the writer feels assured that this is very detrimental to the fruiting tendency of the tree; not so much from the bearing surface removed, but due to the inhibitory action of the growing tips being removed from the older portion of the limbs, and allowing them to rush into rank growth instead of fruiting naturally. This growth then has to harden up and regain a normal tendency before fruiting, many months thus being lost. A bearing tree, which has been properly developed, should only require the removal of limbs crossing out of their place in the tree, the removal of dead wood and the lifting of the skirts sufficiently to just clear the ground. This is advisable as fruit resting on the ground will either blanch or bruise, rendering it of poor grade for the market.

If it is necessary to prune an orchard of large trees which have never had any care, the best time will be immediately after all danger of heavy frost is over, as in many places they will be thrown open to the sun, and this will give them time to cover themselves before intensely hot weather sets in. In handling trees in this condition do not be afraid to remove all misplaced branches, but avoid heading in so far as possible. Keep all dead wood removed. Keep all rank sucker types of growth removed.

The ideal tree of bearing age should have a well formed and symmetrically developed structural framework. The foliage should be like an umbrella, the center being hollow, admitting light and air for the proper development of fruit. While the limbs will droop to the ground, it should be out and down from above and not the limbs coming from the trunk close to the ground.

The proper time for any minor pruning is at the time one sees the need of it; for heavy and thorough treatment, either late in the Fall or early in the Spring.

In conclusion, it should be borne in mind that most varieties of avocados are destined to make large trees; trees more closely approximating a walnut in size than a citrus tree. The course pursued should be governed by this fact.

ADVERTISING AND PUBLICITY IN THEIR RELATION TO THE AVOCADO INDUSTRY

J. C. KNOLLIN

Many members of the Avocado Association may feel that it is not yet time to give serious thought to publicity and advertising. I realized when my subject was assigned that I would have to give a sort of "futurist" talk. However, I feel that the necessity for publicity and advertising will be upon the avocado industry before we realize it.

It is not too early to give serious thought to these questions.

I will venture to say that not one of ten thousand persons east of the Rocky Mountains knows the taste of an avocado nor even knows the name, or what it stands for. We must realize what a prejudice, therefore, is to be overcome when production reaches the point where there are not enough consumers.

The public must be educated in advance. We should, figuratively speaking, have the consumer's mouth watering for the avocado before we are producing more than we can sell. And I am sure most of the members will agree that it is better to have greater production and lower prices with consequently increased consumption, than to continue under present conditions, with the fruit selling at a price which makes it almost prohibitive to the average consumer.

The spirit of the times in co-operative marketing is to increase consumption and demand rather than to decrease production. Consumption and demand are increased by publicity and advertising.

1. PUBLICITY

(a) *Possibilities for Individual Work.*

What can the individual member of the Association do at once to place and keep the avocado in the "lime-light"? Such suggestions as I may make will seem unimportant perhaps when measured by individual effort. But when multiplied by three or four hundred, individual work assumes great importance. Therefore, let each of us resolve immediately to do something that will advertise and make better known the avocado.

First, let us THINK avocados; think of ways and means to tell the world about the wonderful qualities of this fruit. By thinking in terms of the avocado, we shall find new opportunities to advertise it.

Second, let us TALK avocados. Whenever we have an opportunity let us mention this delicious fruit to our friends; urge them to try it; tell them of our belief in its future. Every bit of avocado gossip that we start will spread and grow until it becomes a potent force.

Third, let us WRITE avocados. Write to the folks back home; write to the editors of the newspapers. Whenever we write to a friend or business associate let us devise ways and means to include a good word for the avocado.

Fourth, let us DREAM avocados. Many persons laugh at dreamers, but we must remember that it is the dreamer whose dreams have come true that has made history and brought about most of the world's progress. Therefore, let us dream of the time when the avocado will be planted upon thousands more of California's fertile acres; when the fruit will be shipped East by the train-load, and when untold wealth will jingle in the growers' pockets.

(b) *Possibilities for Association Work.*

What can the Association officially do NOW by way of giving publicity to the avocado?

Perhaps it is not too soon to establish a committee or fund for the purpose of getting the avocado into print. I believe it would pay the Association well to set aside a sum of money sufficient to employ a trained agricultural writer to prepare avocado articles, even though for the present, he gave only part of his time to this work.

Such a writer could secure a great deal of space for articles and photographs, not only in the local and eastern farm papers, but also in the National magazines, especially the women's magazines, such as the *Woman's Home Companion*, *Ladies Home Journal*, *Pictorial Review* and others. Perhaps no more effective means could be adopted of getting the avocado before the future consumer than by the effective use of illustrated articles in these women's magazines.

Such articles should emphasize the fact that the avocado is the principal article of diet in other countries. Also they should tell of the many delicious ways of serving the food. No doubt many other magazines would welcome also properly prepared articles, telling merely of the accomplishments of the Association and the prospects for future development of the industry.

Sent out upon official Association stationery, such authentic articles undoubtedly would be received eagerly by hundreds of editors.

Another opportunity for Association work lies in the preparation of leaflets and so-called "light literature" about the avocado. No doubt it would be worth while to print a large number of "stuffers" discussing briefly avocado facts in a popular vein, these to be furnished to all members for use in their correspondence. Thousands of letters which carry a 2-cent stamp do not reach the maximum weight and if each member would place one or two of these leaflets into selected letters among his daily correspondence, it would be possible to distribute a great deal of avocado literature with no expense for postage.

A further field for Association work would be in reporting promptly to the local agricultural press all developments of technical interest to fruit growers, including results of experiments by individual members or by the Association's committees.

2. ADVERTISING

Advertising does not mean always simply the purchase of space in magazines and newspapers. We advertise the avocado when we do all the things suggested under publicity. Perhaps it is a little early to consider advertising in the usual sense of the word, but we can readily visualize the official announcements of the Association as they are to appear in years to come along side of those of "Sunkist" fruits, "Sun Maid Raisins," and "Sun Sweet Prunes."

The Avocado Association has an advantage over its predecessors in having the opportunity to learn by the experience of others. The great fruit growers' organizations have blazed the trail and undoubtedly the avocado growers will follow in their footsteps before very long, developing also new ideas of their own.

It is not difficult to visualize an attractive "ad," illustrating in beautiful colors, a perfect avocado served in a delicious manner—a tempting picture of deliciousness. There is no harm in thinking about these things. They are coming very soon.

Still looking ahead a bit we can anticipate the discovery of certain wonderful qualities in the avocado, making it perhaps a veritable "fountain of youth." The raisin growers have found that the raisin is full of iron, which the patent medicine manufacturers have advertised all over the world as the basis of human health and happiness.

It is an interesting coincidence that the raisin advertisers should have discovered in this common fruit an element already so thoroughly advertised. Perhaps we can find in the avocado a quality which will clear an aging face of wrinkles or restore hair to the bald spot of the middle-aged man.

Seriously, we know that the avocado possesses important medicinal properties. I have learned just recently of a local sanitorium in which patients have been treated successfully upon a strict avocado diet. Interesting possibilities may be developed along this line.

However, there are certain forms of advertising that we can undertake now, both individually and as an Association. One of these is in educating the school children. They are the future consumers. Every grower who gives the school child a taste of the good avocado, is laying the foundation for a future demand. Let us get avocado lecturers into the school and acquaint the youngsters with this wonderful fruit.

It should be possible to interest prominent educators in the subject, and the right sort of information combined with a sample of the fruit, should make an enthusiast out of the average child, for every youngster knows a good thing when he sees it or tastes it.

It would be well to commence now in the gathering together of all data, including testimonials, which would be of value later in advertising the avocado.

I have tried to give definite suggestions as to steps that should be taken immediately and I would suggest that each member present make a resolution tonight to think, talk, write and, last but not least, to dream avocados.

EXCERPTS FROM A LETTER FROM S. F. MOZNETTE, ENTOMOLOGIST, MIAMI, FLA.

"I regret that it will be impossible for me to prepare a paper at this time as much as I would like. This is due to the fact that I will leave shortly for Cuba and the Bahama Islands to study conditions relative to the avocado and mango in these localities, especially to gather information as to parasites possible of introduction into Florida, to be used against the injurious pests we have here. However, this letter may possibly be of some interest to the growers of the avocado in California. I am in hopes that some time soon I may be able to attend one of your interesting meetings which you hold in California.

"You inquire relative to the behavior of the various avocados we have here in Florida. Generally the avocado is a heavy feeder and likes plenty of water for its best performance. What I really had in mind when I mentioned hybrids to you was, not so much whether the particular variety would be hardy, but the character of the stock. The Mexican avocado with us here has a rather poor root system, and when grown under dry conditions, where the moisture is not conserved by proper mulching will not do much. Perhaps with some of your strains in California such as the Colorado, where the trees have not sufficiently established themselves and have not developed sufficient root system for the trees' proper development, the trees may be constitutionally weak. Perhaps this is the cause of the spotting which develops on the fruit with this variety. The Guatemalan varieties with us here develop a splendid root system with a deep tap root. If these two strains could be crossed so that you get a happy medium in a hybrid, which under your conditions will be resistant and especially possessing a good root system capable of supplying the tree with the necessary water for proper development, a cross of value might result. Under our conditions, where the avocado does not obtain the proper amount of water for development, trees develop a shriveling and drying of the leaves, physiological spotting of the fruit, etc.

"As stated in my previous letter, recently a number of most promising hybrids have been developed at the Plant Introduction Garden here at Miami, Fla., which bid fair to aid greatly in the future development of the avocado industry in Florida as regards both stock and trees."

AN APPRECIATION OF THE WORK OF THE LATE JACOB MILLER

JAS. H. POPE

With the death on May 19, 1920 of Mr. Jacob Miller of Hollywood, the avocado industry of Southern California saw the passing of one of its oldest pioneers.

Mr. Miller's interest in the avocado began in 1883 and continued throughout the remainder of his life.

His contribution to the early development of the industry was important from two standpoints. The first was the proof that the fruit could be successfully grown without damage by frost and the second was the arousing of interest in the fruit and the consequent distribution of trees through a broad district.

Mr. Miller obtained his first avocado tree from Mr. John Greleck, an uncle of Mrs. Miller. Mr. Greleck on a visit to Guatemala had his attention attracted to the fruit and upon his return he brought a number of young trees with him. One of these trees which was afterward known as the "Miller" was given by Mr. Greleck to Mr. Miller and by the latter set out on his ranch at the mouth of Nichol's Canyon at a point which is now marked by the intersection of Hollywood Boulevard and Ogden Drive. Mr. Miller at this time was raising garden truck for the San Francisco market and knew that the district was frostless.

Mr. Greleck planted the remainder of his avocado trees on his own place at what is now Main and Twenty-fifth streets. The following winter saw severe damage from frost to the Greleck trees and to avoid losing what survived in some subsequent frost the plants were moved to the Miller place. Among the plants which were brought by Mr. Greleck and given to Mr. Miller after the frost at the Greleck place were the cherimoya, mango, tamarind, plumaria, coffee, papaya, rose apple and other rare tropical fruits.

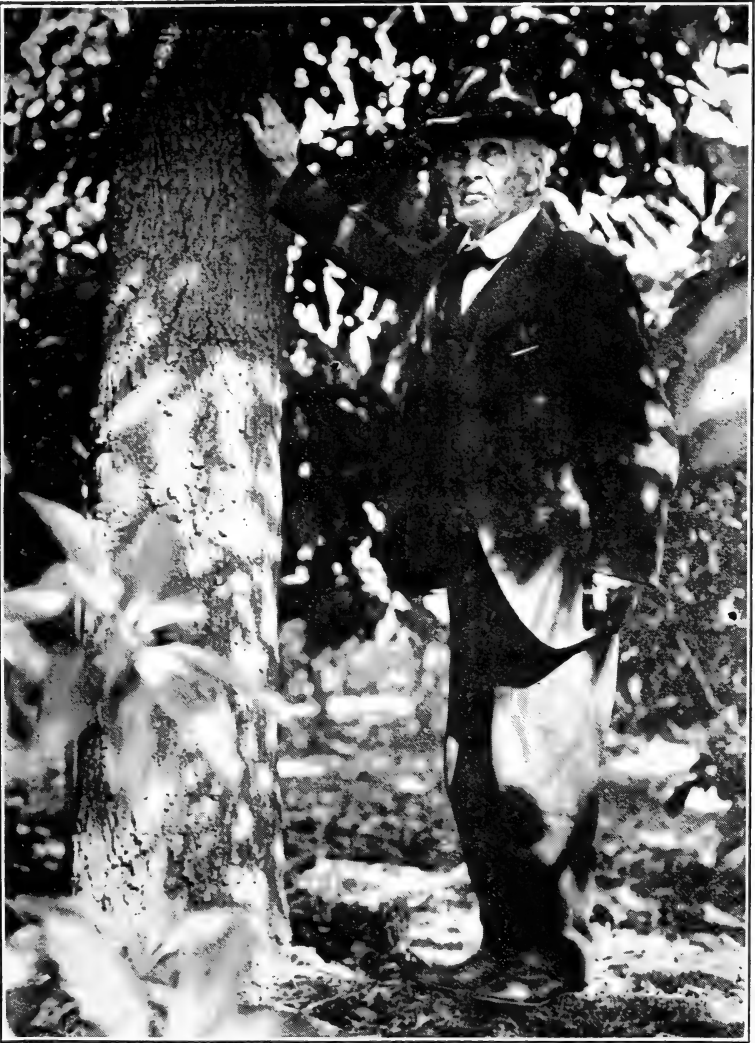
The following is an expression of Mrs. Theresa Burdette, a daughter of Mr. Miller:

"In the early days the old tree which is now known as the "Miller" was crowded into a garden of a great variety of plants, and under those conditions it bore very sparsely. A young pine which was planted on the side of the morning sun shut out the light and sunshine and the avocado soon showed signs of its influence.

"About 1896 it was found necessary to transplant the avocado to its present location about a city block north of its original location. It revived and in two years was again bearing fruit. It is this year bearing the heaviest crop in its history some of the branches being very heavily laden with fruit and the entire tree ranking as very prolific.

"In the early days the seeds of the fruits were planted by my father and little by little quite a collection of trees was gathered. These trees were sold or given to numerous persons who had eaten the fruit at our home and wanted to take a tree with them. In this manner seedling trees from the Miller were quite widely distributed. Later budded trees were also given out.

"If it had not been for the tender care given these first trees they probably would have been lost to California for many years. To my mind it was my father's natural love for all plants that made it possible for California to begin at such an early date to figure in the history of the avocado industry."



JACOB MILLER

BY-LAWS OF CALIFORNIA AVOCADO ASSOCIATION

Revised and adopted at Annual Meeting of California Avocado Association, May 7, 1921.

ARTICLE I

Name

The name of this Association shall be California Avocado Association.

ARTICLE II

Purpose

The purpose of this Association shall be to improve the culture, production and marketing of the avocado.

ARTICLE III

Membership and Dues

Section 1. Any persons interested in the purposes of this Association may, upon application and payment of required dues, be elected to either active or associate membership in accordance with their application by an affirmative vote of two-thirds of the Directors present at a meeting of the Board of Directors.

Section 2. The Secretary shall notify a member of his election and send him a copy of the By-Laws of this Association.

Section 3-a. The active membership fee shall be \$16.00 per year, payable in quarterly payments upon first days of January, April, July, and October of each year. Each new member shall pay the dues for the quarter in which he is accepted as member. The associate membership fee shall be \$5.00, payable at the time the application for membership is made, and thereafter shall become due and payable on January 1st of each year. Upon election the new member shall be entitled to all publications of the Association for the calendar year in which he is elected.

Section 3-b. Every active member in good standing, when present in person or by proxy, shall have a vote upon all matters coming before the Association in its meetings, is eligible to act as an officer of the Association, and shall, subject to other rules and regulations, be allowed to market his fruit thru the Association. Every associate member in good standing, when present in person or by proxy, shall have a vote upon all matters coming before the Association at its meetings, and shall be given the benefit of all literature and information available to active members, but shall not be eligible to act as an officer in the Association or be allowed to market any fruit thru the Association.

Section 3-c. An associate member may become an active member at any time by payment of the difference in membership fee, the difference to be calculated from January 1st of the year in which the change is made.

Section 4. No person shall be enrolled as a new member of this Association until his dues have been paid as herein provided.

Section 5. Only members in good and regular standing, whose dues are paid, shall be entitled to vote at meetings of the Association, and only such shall be eligible to office.

Section 6. The membership of any member may be terminated for cause by a two-thirds vote of the entire Board of Directors, the accused being given opportunity for a hearing before action is taken.

Section 7. Persons who have contributed distinguished service in aiding the purposes of this Association may be elected to Honorary Membership, without dues and without vote, by a unanimous vote of the Board of Directors, or by a two-thirds vote of the members present and voting at the annual meeting of the Association.

ARTICLE IV

Directors and Officers

Section 1. The government of this Association, the direction of its work, the control of its property and funds shall be vested in a Board of Directors consisting of nine members, three of whom shall be elected by ballot at each annual meeting of the Association and serve for a term of three years.

Section 2. Shortly after the annual meeting of the Association the Board of Directors shall convene and elect by ballot from its members a President, a Vice-President, also a Secretary and a Treasurer, who may or may not be Directors, who shall hold office for one year or until their successors are elected. The office of Secretary and Treasurer may be filled by one person in the discretion of the Board of Directors.

Section 3. The officers (Art. IV, Sec. 2) shall constitute the Executive Committee of the Board of Directors; said committee to exercise such powers and deal with such matters as may be referred to it by the Board of Directors.

Sections 4. Meetings of the Board of Directors may be called at any time by order of the President, or by the Vice-President acting in his absence, and shall also be called at the request in writing of three members of the Board; the time, place and purpose of such meeting to be designated in said call. A majority of the Board of Directors shall constitute a quorum.

Section 5. The Board of Directors shall have the power to fill any vacancy in their number or any vacancy in any office in the Association.

Section 6. It shall be the duty of the Board of Directors when the development of the industry makes it desirable and necessary, to provide for the co-operative marketing and distribution of the avocado crop.

ARTICLE V

Duties of Officers

Section 1. The President shall preside at all meetings of the members and of the Board of Directors. In event of the absence of both the President and the Vice-President, the members of the Board of Directors may elect a pre-

siding officer for such meeting. The President shall submit to the annual meeting a report of the doings of the Board of Directors and of the affairs and operations of the Association during the preceding year.

Section 2. The Vice-President shall in the absence or disability of the President, perform the duties of the President.

Section 3. The Secretary shall be the clerical officer of this Association and of the Board of Directors, and shall have charge of the general correspondence. He shall collect the dues of the members and receive all moneys that may be paid to him by virtue of his office, carefully account for the same and promptly cover them into the treasury. He shall work under the orders of the Board of Directors and at all times in close co-operation with the President.

Section 4. The Treasurer shall be the financial officer of this Association and of the Board of Directors. He shall have charge of the funds of the Association, paying them out only by voucher countersigned by the President. He shall make a report of receipts and disbursements at meetings of the Board of Directors and a complete report to the members at the annual meeting of the Association.

ARTICLE VI

Meetings

Section 1. The annual meeting of the members of the Association shall be held at some convenient period during May of each year; the time and place of such meeting to be designated by the Board of Directors, and ample notice of the meeting shall be given to the membership of the Association.

Section 2. Special meetings of the Association may be called by the President with the approval of the Board of Directors, as occasion may require.

Section 3. Twenty-five members entitled to vote shall constitute a quorum at any meeting of the members of the Association for the transaction of business.

ARTICLE VII

The fiscal year of the Association shall close on April 30th.

ARTICLE VIII

Amendments

These By-Laws may be changed or amended at any regular meeting of the Association by a two-thirds vote of all members present at such meeting.

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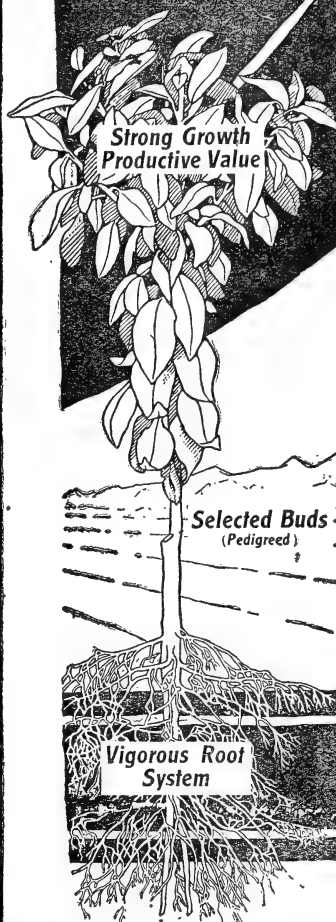
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Because they bear young, heavily and consistently.
Because the fruit stems are short and thick while the fruit is large, fine flavor, hard shell and of excellent shipping qualities.

By virtue of the upright habit of growth of these trees, they can be planted from ten to twelve feet apart each way in orchard form, making from three to four hundred trees per acre.

The value of the fruit and the large number of trees which can be planted per acre are the propelling factors for such active planting of the Lyon at this time.

This season is the fourth consecutive year that the Lyon has loaded down with fruit, especially in the Whittier district.

Ten acres of Lyon trees, bearing on the average of fifty fruits per tree would net its lucky owner over fifty thousand dollars, provided that the fruit brought only twenty-five cents each.

In the official analysis the Lyon secured the highest honors, with the Fuerte second. Here is the record of each for comparison: Lyon—fat, 26.89%; protein, 4.37%. Fuerte—fat, 29.93%; protein, 2.10%. The Lyon and Fuerte tied for the smallest proportion of seed and the Lyon secured third place in the largest amount of edible portion.

(SEE NEXT PAGE)

The road to Wealth and the road to Health lies through the Lyon Avocados. By far the most valuable food product of this day and age. The perfect fruit and food for sanitariums, hospitals, fancy hotels, clubs, etc. The ideal food for the well, the sick and the convalescent. Judging from the manner in which the populace turned to the Lyon this season, I feel safe in predicting that there will be more Lyon trees set out in orchard form in the next few years than all other sorts combined.

Orders for Lyon buds and trees are pouring in continually. A few days ago I received an order for five hundred trees from a customer in Santa Barbara, three hundred of which were to be the Lyon.

This week I received an order from a nurseryman for one thousand buds and another order from another nurseryman for twelve hundred buds; both of these orders were for orchard budding. A few weeks ago the Lyon had the honor, as far as I know, of capturing the largest order for budwood ever placed in Southern California. The San Joaquin Fruit Company of Tustin placed an order for four thousand Lyon buds to be used in their own orchard plantings.

Why not raise your own Lyon orchards? You can do it with but very little cost. If interested, please write and I will tell you how to do it.

The public is invited to visit my place week days only. My trees are all grown in the open and I fully guarantee them.

The Lyon tree is the greatest creation God ever made, and it surely is the "Poor Man's Friend."

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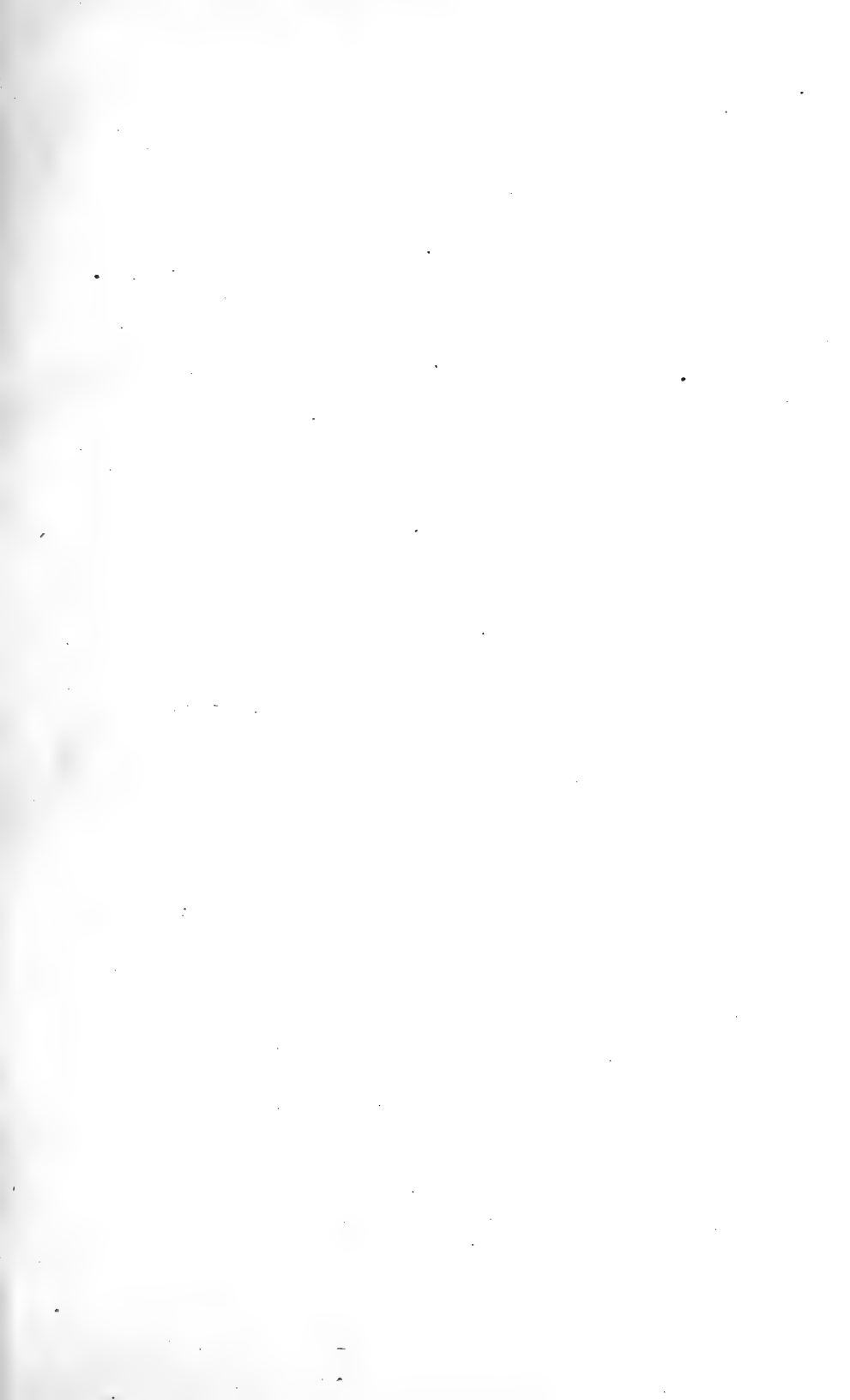
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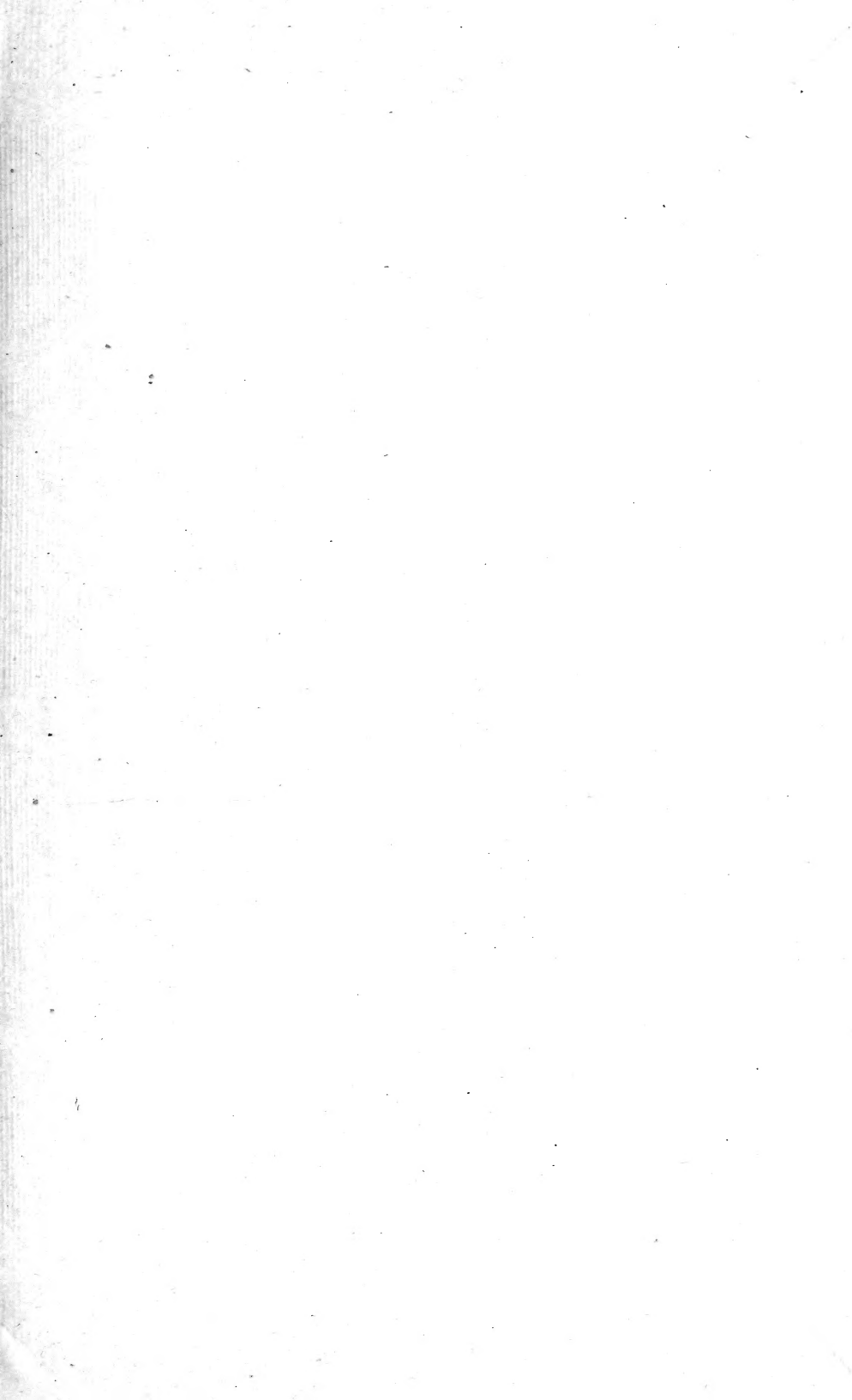
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